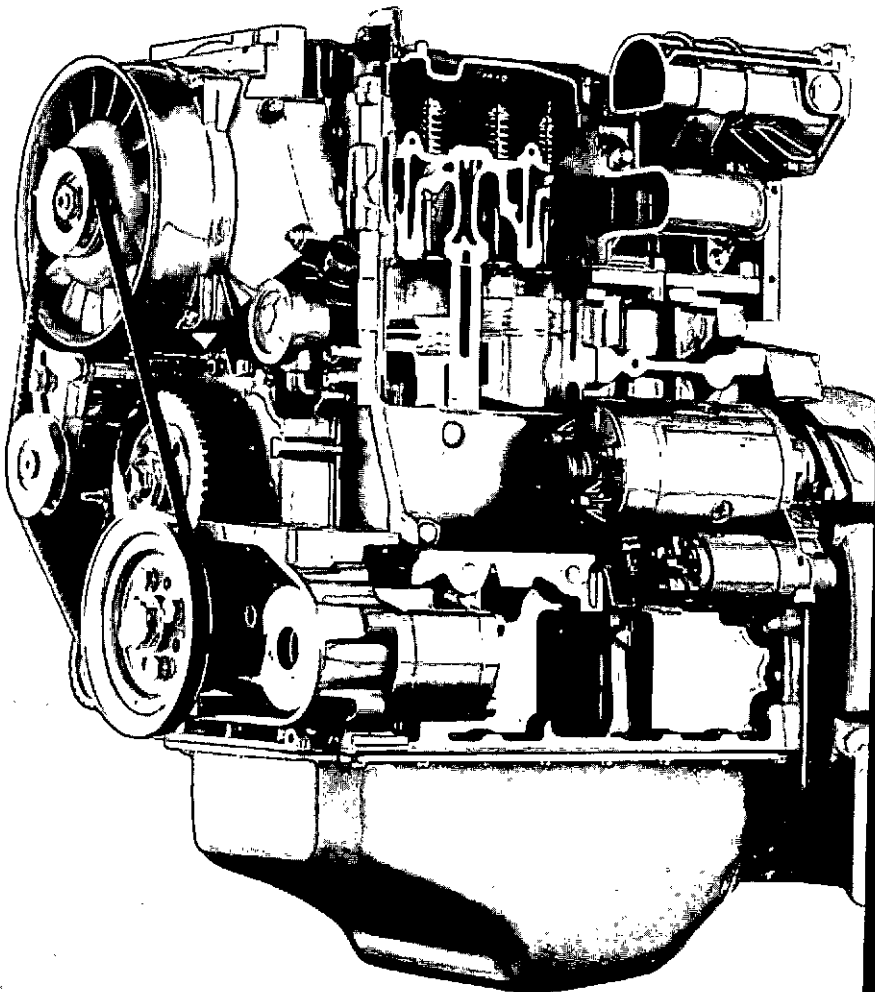


Workshop Manual B/FL 1011/T



Contents and lay-out: Department AZ-MD
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1st Edition, 10 / 1988

In view of the constant improvements to our engines, the specification data and other technical information included in this Workshop Manual are subject to change. No part of this Manual may be reproduced in any form or by any means without our written permission.

Werkstatthandbuch B/FL 1011/T
Workshop Manual B/FL 1011/T
Manuel d'Atelier B/FL 1011/T
Manual de Taller B/FL 1011/T



0291 1942

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Service telephone for technical enquiries

Personal answering from 8:15 a.m. to 5:00 p.m.



(404) 564-7100

DEUTZ CORPORATION • 3883 Steve Reynolds Blvd. • Norcross, Georgia 30093

FOREWORD

Reliable engine operation is dependent on properly executed repairs as well as adjustment work.

This Workshop Manual describes the appropriate operations for any repair and adjustment work on the engine and engine components. It is presumed that this work will be carried out by qualified personnel.

The Manual has been made up in a manner which ensures quick comprehension of the contents, i. e. graphic symbols have been placed beside the brief text passages, which visualize the working operation concerned.

Aspects of operation and maintenance are dealt with in the respective Engine Operation Manual.

For spare parts orders the spare parts catalogue should be referred to.

This Workshop Manual is not regularly updated. Any engineering changes having been introduced in the meantime will be considered in the next issue. Therefore please refer to the information announced in our Technical Circulars when carrying out repairs.

General:

- Please read carefully and observe the instructions given in this Workshop Manual. This will avoid accidents and will help to ensure that your engine always functions properly and reliably.
- Make sure that this Workshop Manual is readily available for everybody carrying out repair or adjustments and that the instructions are well understood.
- Non-compliance with given instructions may result in functional trouble and engine damage as well as personal injury for which the manufacturer shall not accept any liability.
- The relevant regulations for prevention of accidents as well as other general and legal rules regarding safety and industrial medicine are to be complied with.
- A prerequisite for successful repair is that all required equipment, hand and special tools are available and in perfect condition.
- Optimal operation economy, reliability and durability of the engine can be ensured only when using genuine DEUTZ parts.
- Remember that such engine components as springs, clips, snap rings, etc. involve the risk of injury if not handled with care.
- Engine overhauls must be based on the relevant engine duty schedule - as defined by the equipment manufacturer. For conversions only such parts should be used which DEUTZ develops and supplies specifically for this purpose.

Key to Symbols




















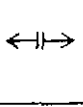

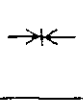






	Disassembly of assembly groups		Guard against personal injury Indication of hazard
	Reassemble to form assembly group		Guard against material damage Damage to parts
	Remove obstructing parts		Prop up – Support – Hold
	Reinstall – Remount parts which had obstructed disassembly		Oil
	Attention! Important notice!		Grease
	Check – Adjust e. g. torque, dimensions, pressures, etc.		Mark before disassembly, observe marks when reassembling
	Special tool		Balance Eliminate any imbalance
	Note direction of installation		Filling – Topping up – Refilling e. g. oil, cooling water, etc.
	Visual inspection		Drain off e. g. oil, cooling water, etc.
	Possibly still serviceable Renew if necessary		Loosen – Release e. g. loosening a clamping device
	Renew at each reassembly		Tighten – Clamp e. g. tightening a clamping device
	Unlock – Lock e. g. split pin, locking plate, etc.		Vent
	Lock – Adhere e. g. with liquid sealant		Machining process
			See Technical Data (For inst. 67 as indication of the line)

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
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Specification data

000 General engine data

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
001	Engine weight w/o starter w.generator ca. kg	162	202	242	248
002	Engine swept volume cm ³	1366	2049	2732	
003	Bore mm	91			
004	Stroke mm	105			
005	Direction of rotation	When facing flywheel left counter-clockwise			
006	Rated speed max. rpm	3000 / 3600			2500
007	Minimum idle speed rpm	900			
008	Working cycle	Four-stroke diesel			


000 General engine data

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
009	Combustion system	Direkl injection			
010	Compression ratio	18,5 : 1			17 : 1
011	Compression pressure bar	25 - 30			22 - 27
012	Firing order	1 - 2	1 - 2 - 3	1 - 3 - 4 - 2	
020	Dimensions of engine incl. standard flywheel				
021	Max. length mm	522	630	741	
022	Max. width mm	444			490
023	Max. height mm	691		711	

1


Specification data

100 Fuel injection system

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
110	Fuel injection pump				
111	Make, model	OMAP			
112	Min. pres. that must be attained with abt. 5 rot. of crankshaft bar	300			
113	Pressure for testing tightness of relief valve bar	150, drop to 140 in a minute permiss.			
120	Governor				
121	Make, model	KHD			

100 Fuel injection system


1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
130	Injection nozzle				
131	Make, model	OMAP			
132	Opening pres. (checking injector for re-use) bar	245 ^{1)B}			245 ^{1)B} 1) 205 ^{1)B}
133	Opening pressure (new condition) bar	250 ^{1)B}			250 ^{1)B} 1) 210 ^{1)B}

1) Engines for Messrs Holder


Specification data

100 Fuel injection system

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T						
140	Commencement of fuel delivery										
141	Static <u>w/o</u> advance / retard unit										
145	Installation dimension of injection pump mm	<table border="0"> <tr> <td>W 1800</td> <td>57,3</td> </tr> <tr> <td>W 1801</td> <td>56,8</td> </tr> <tr> <td>1)</td> <td>57,0</td> </tr> </table>			W 1800	57,3	W 1801	56,8	1)	57,0	58,0
W 1800	57,3										
W 1801	56,8										
1)	57,0										

1) Engines for Messrs Holder

200-400 Cylinder unit


	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
200	Cylinder head				
210	Valve guide				
211	Valve guide Outer dia. mm				
212	Valve guide bore in cyl. head mm				
213	Valve guide Inner dia. mm	8 ^{+0,025}			
220	Valve seat insert				
221	Valve seat insert Outer dia. Inlet mm	42,67 ±0,005			
222	Number of oversizes	1			

1


Specification data

200-400 Cylinder unit

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
223	Each oversize	0,2			
224	Valve seat Outer dia. Exhaust mm	37,07 ±0.005			
225	Number of oversize	1			
226	Each oversize	0,2			
227	Valve seat insert bore Inlet mm	42,6 +0.03			
228	Valve seat insert bore Exhaust mm	37 +0.03			
230	Valve				
231	Valve stem dia. Inlet mm	7,98 -0.015			

200-400 Cylinder unit


	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
232	Valve stem dia. Exhaust mm	7,96 ^{-0,015}			
233	Valve stem clearance Inlet standard mm	0,02 - 0,06			
234	Valve stem clearance Inlet Wear limit mm	0,12			
235	Valve stem clearance Exhaust standard mm	0,04 - 0,08			
236	Valve stem clearance Exhaust Wear limit mm	0,15			
237	Valve head ∅ Inlet mm	40,1 ± 0,1			40,5 ± 0,1
238	Valve head ∅ Exhaust mm	34,9 ± 0,1			

1

Specification data


200-400 Cylinder unit

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
239	Valve seat width Inlet mm	1,7 ±0,4			1,58 ±0,4
240	Valve seat width Exhaust mm	1,7 ±0,4			
241	Seat angle Inlet deg.	45			30
242	Seat angle Exhaust deg.	45			
243	Marg. thickness Inlet standard mm	1,25			1,87
244	Marg. thickness Exhaust standard mm	1,85			
245	Marg. thickness inlet Wear limit mm	0,8			1,4
246	Marg. thickness Exhaust Wear limit mm	1,2			

200-400 Cylinder unit


1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
250	Valve spring				
251	Number per valve		1		
252	Windings total		6,2		
253	Length unloaded standard mm		44,3		
254	Length unloaded Fatigue limit mm				
260	Standard Valve clearance				
261	Inlet mm		0,3		
262	Exhaust mm		0,5		

Specification data


200-400 Cylinder unit

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
270	Distances to be checked				
271	Valve recess standard mm	1 ±0,13			0,8 ±0,13
272	Wear limit mm	1,53			1,3

200-400 Cylinder unit


1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
280	Cylinder head studs				
281	Length standard mm	185 ±0.8			
282	Length Limit mm				

Specification data


200-400 Cylinder unit

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
300	Cylinder				
301	Bore standard mm	91 +0,02			
302	Bore Wear limit mm	0,1			
303	Number of oversizes				
304	Each oversize mm				


200-400 Cylinder unit

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
400	Piston				
401	Diameter standard mm	90,93			90,92
402	Number of oversizes				
403	Each oversize mm				
404	Distance between piston and cylinder head mm				
405	Bore for piston pin mm	26 $\begin{matrix} +0,01 \\ +0,004 \end{matrix}$			30 $\begin{matrix} +0,01 \\ +0,004 \end{matrix}$
406	Piston pin diameter mm	26 -0,005			30 -0,005


Specification data

200-400 Cylinder unit

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
410	Piston ring groove height				
411	1st ring mm	$2,0 \begin{matrix} +0,10 \\ +0,08 \end{matrix}$			
412	2nd ring mm	$2,0 \begin{matrix} +0,07 \\ +0,05 \end{matrix}$			
413	3rd ring mm	$3,0 \begin{matrix} +0,04 \\ +0,02 \end{matrix}$			

1


200-400 Cylinder unit

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
420	Piston rings				
421	Axial clearance 1st ring standard mm	0,09 - 0,12			
422	Wear limit mm	0,2			
423	Axial clearance 2nd ring standard mm	0,07 - 0,102			
424	Wear limit mm	0,16			
425	Axial clearance 3rd ring standard mm	0,04 - 0,075			
426	Wear limit mm	0,12			


Specification data

200-400 Cylinder unit

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
429	Gap 1st ring standard mm	0,3 - 0,5			0,3 - 0,45
430	Wear limit mm	0,8			
431	Gap 2nd ring standard mm	0,8 - 1,05			
432	Wear limit mm	1,8			
433	Gap 3rd ring standard mm	0,45 - 0,7			
434	Wear limit mm	1,2			

500-700 Motion parts


	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
500	Crankshaft				
510	Crankpin				
511	Pin width standard mm			31	
512	Pin diameter standard I mm			55 ^{-0,01} _{-0,03}	
513	Pin diameter standard II mm				
514	Each undersize mm			0,25	
515	Limit for undersize mm			54,5 ^{-0,01} _{-0,03}	
516	Pin ovality Waer limit mm			0,01	

1


Specification data

500-700 Motion parts

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
517	Radius of fillet mm				
518	Pin hardness standard HRc	non-hardened, strength-rolled			
519	Limit value HV 1				
520	Main journal				
521	Journal width standard mm	35			
522	Journal dia. standard I mm	70 ^{-0.01} _{-0.03}			
523	Journal dia. standard II mm				
524	Each undersize mm	0,25			


500-700 Motion parts

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
525	Limit for undersize mm	69,5 ^{-0,01} _{-0,03}			
526	Journal ovality Wear limit mm	0,008			
527	Eccentricity max. perm. mm	0,05			
528	Radius of fillet mm				
529	Journal hardness, standard HRC	<i>non-hardened, strength-rolled</i>			
530	Limit value HV 1				
540	Thrust bearing journal				
541	Journal width standard mm	35 ^{+0,04}			


1

Specification data

500-700 Motion parts

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
542	Journal width standard II mm				
543	Each oversize mm	0,4			
544	Limit for oversize mm	35,44			
550	Main bearing				
551	Bearing shells inner dia. standard I mm	70,02 - 70,055			
552	Bearing shells inner dia. standard II mm				
553	Each undersize mm	0,25			
554	Limit for undersize mm	69,52 - 69,555			


500-700 Motion parts

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
555	Radial clearance standard mm	0,03 - 0,084			
556	Radial clearance Wear limit mm	0,12			
560	Main bearing bore				
561	Bearing bore in crankcase standard mm	75 +0,019			
562	Bearing bore in crankcase oversize mm				
570	Thrust bearing (with stop rings)				
571	Outside distance of stop rings standard I mm	34,9 -0,133			
572	Outside distance of stop rings standard II mm				

1


Specification data

500-700 Motion parts

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
573	Each oversize mm	0,4			
574	Limit for oversize mm	35,7 $-0,133$			
575	Crankshaft axial clearance standard mm	0,1 - 0,3			
576	Wear limit mm	0,4			
600	Connecting rod				
601	Centre distance from small eye bush to big eye bore mm	173 $\pm 0,03$			
602	Bore for piston pin bush mm	29 $+0,02$			33 $+0,02$
603	Piston pin bush Outer dia. mm	29 $+0,1$ $+0,06$			33 $+0,11$ $+0,07$

500-700 Motion parts


1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
604	Piston pin bush (pressed in) Inner dia. mm		$26 \begin{matrix} +0,035 \\ +0,025 \end{matrix}$		$30 \begin{matrix} +0,035 \\ +0,025 \end{matrix}$
605	Piston pin clearance mm	0,025 - 0,04			
606	Wear limit mm	0,08			
607	Bore for big end bearing mm	58,5 $+0,02$			
608	Big end bearing shells Inner dia. standard I mm	55,004 - 55,04			
609	Big end bearing shells Inner dia. standard II mm				
610	Each undersize mm	0,25			
611	Limit for undersize mm	54,504 - 54,54			


Specification data

500-700 Motion parts

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
612	Big end bearing radial clearance standard mm	0,024 - 0,078			
613	Big end bearing radial clearance Wear limit mm	0,12			
614	Big end bearing width mm	25,6 -0,3			
615	Connecting rod width mm	27 -0,06			
616	Connecting rod axial clearance, standard mm	0,2 - 0,56			
617	Connecting rod axial clearance Wear limit mm	0,8			

500-700 Motion parts


	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
710	Camshaft				
711	Axial clearance, standard mm	0,3 - 0,6			
712	Axial clearance Wear limit mm	0,8			
713	Camshaft bearing Inner dia. standard mm	51 +0,054			
714	Radial clearance, standard mm	0,05 - 0,124			
715	Radial clearance Wear limit mm	0,15			

1

Specification data


500-700 Motion parts

1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
716	Cam lift Inlet mm	6,6			
717	Exhaust mm	6,8			
720	Valve timing with valve clearance adjusted mm				
721	Inlet opens before TDC degrees	45			47
722	Inlet closet after BDC degrees	65			63
723	Exhaust opens before BDC degrees	76			99° 30"
724	Exhaust closet after TDC degrees	44			51° 30"

800 Lubrication system


1

	English	F2L 1011	F3L 1011	F4L 1011	BF4L 1011 T
800	Lube oil pump				
810	Lube oil pressure				
811	Pressurestat bar	6			
812	Lube oil pressure at low idling Temperature approx. 120°C oil SAE20W/20 Min. bar	1,1			
815	By-pass valve on filter housing bar				
816	Pump speed / Engine speed rpm				
817	Delivery rate ± 10% at 4 bar 60° C oil SAE 20 l/h	60		85	100


Specification data

1

Tightening Specifications

	English	Initial tightening Nm	Tightening angles				Total	Remarks
			1.	2.	3.	4.		
922								
923	Oil filter bracket bolts M 6 x 25 8.8 M 6 x 35 8.8						10 ± 1 Nm	
924	Oil intake housing bolts M 8 x 75 Torx						22 ± 2 Nm	
925	Fuel pump bolts M 8 x 20 Torx 8.8						22 ± 2 Nm	
926	Injection pump nuts						22 ± 2 Nm	
927	Injector cap nut						45 ± 5 Nm	
928	Injector fastening bolt M 8 x 35 Torx 8.8						20 ± 2 Nm	
929	Injection line						15 ± 1,5 Nm	

Tightening Specifications


	English	Initial tightening Nm	Tightening angles				Total	Remarks
			1.	2.	3.	4.		
930	Air intake manifold bolts M 8 x 30 Torx 8.8						22 ± 2 Nm	
931	Air intake manifold 3-hole flange bolts M 8 x 35 Torx 8.8						22 ± 2 Nm	
932	Exhaust manifold bolts M 10 x 30 Torx 10.9						40 ± 4 Nm	
933	Starter fastening bolts M 10 x 28 8.8						42 ± 4 Nm	
934	Starter carrier bolts M 12 x 28 8.8						75 ± 7 Nm	
935	Oil pan bolts M 8 x 16 Torx 8.8						22 ± 2 Nm	
936	Oil drain bolts						55 ± 5 Nm	
937	Rear mounting foot bolts M 12 x 30 10.9						106 Nm	

1


Specification data

Tightening Specifications

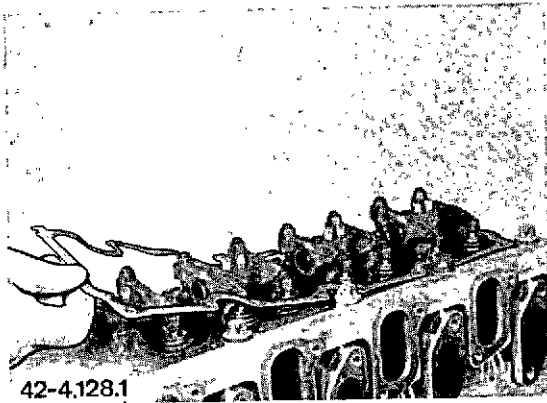
1

	English	Initial tightening Nm	Tightening angles				Total	Remarks
			1.	2.	3.	4.		
938	Front mounting foot bolts M 14 x 55 10.9						168 Nm	
939	Termostat housing screw plug M 38 x 1,5						50 ⁺¹⁰ Nm	
940	Thermostat housing bolts M 6 x 35 Torx 8.8						7,5 ^{+1,5} Nm	
941	Thermostat housing bolts M 6 x 80 Torx 8.8						7,5 ^{+1,5} Nm	
942	Valve plunger housing bolts M 8 x 30 Torx 8.8						19 ⁺³ Nm	
943	Thermostat housing bolts M 8 x 105 Torx 8.8						19 ⁺³ Nm	
944	Alternator nuts M 5						4 Nm	
945	Fuel filter bracket bolts M 8 x 20 8.8						20 Nm	

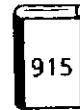
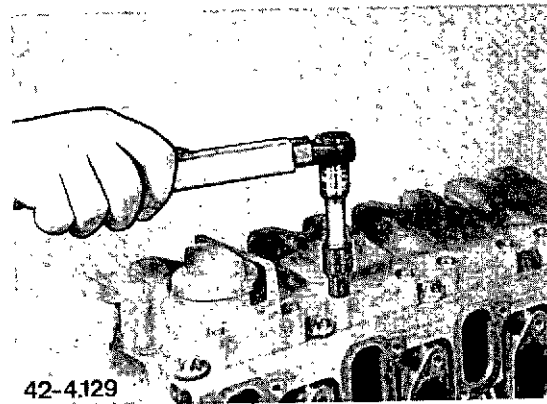
Tightening Specifications

	English	Initial tightening Nm	Tightening angles				Total	Remarks
			1.	2.	3.	4.		
946	Adapter housing bolts M 12 x 35 10.9 M 12 x 75 10.9						95 ± 10 Nm	
961	Crankcase screw plugs 1. M30 x 1,5 2. M20 x 1,5 3. M10 x 1 4. M6 x 12 5. M16 x 1,5 6. M30 x 1,5						60 ± 6 Nm 35 ± 3,5 Nm 12 ± 1,5 Nm 5 ± 1 Nm 26 ± 3 Nm 60 ± 6 Nm	
962	Oil pressure control valve screw plugs						190 Nm	
963	Hydraulic pump bracket bolts BM10 x 90 Torx 10.9						57 Nm	
964	Hydraulic pump bolts M10 x 100 10.9 M10 x 110 10.9 M10 x 210 10.9						57 Nm	
965	Exhaust turbocharger nuts M8						29 Nm	
966	Oil return line cap nut						60 ± 3 Nm	

1



3. Put gasket in place.



4. Fit cylinder head cover. Tighten bolts in accordance with specifications.

2

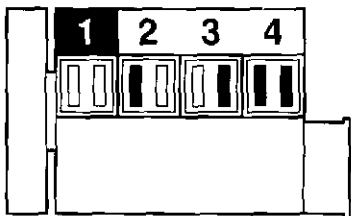
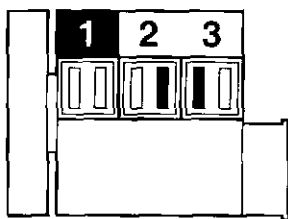
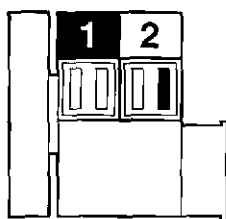
Schematic for valve clearance adjustment

Crankshaft position

1

Turn engine until valves of cylinder No. 1 overlap.

Not ready for adjustment

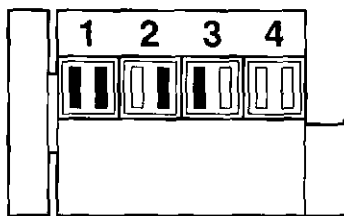
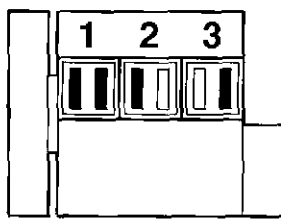
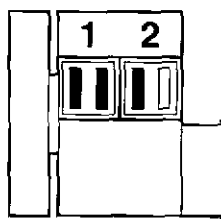


Crankshaft position

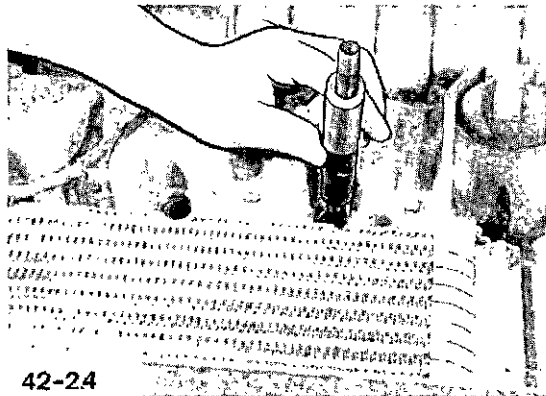
2:

Turn engine further by one complete revolution (360°).

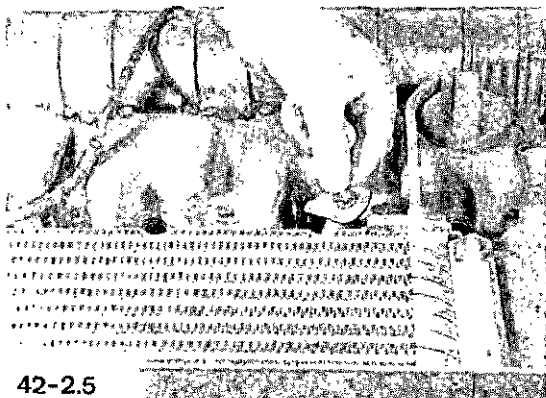
Ready for adjustment



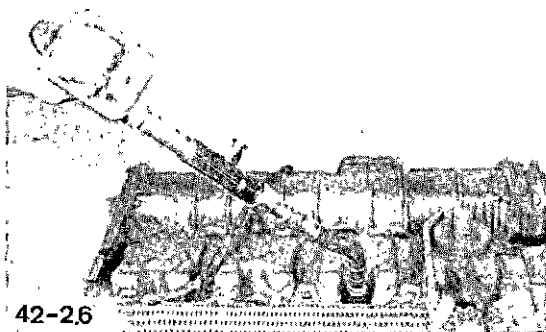
2



42-24



42-25



42-26

Compression pressure

Commercial tools required:
Compression tester 2461 Torx tools.

Special tool required:
Adapter 100090



**Injectors have been removed
Valve clearance has been checked.**

1. Insert adapter with new special sealing ring.



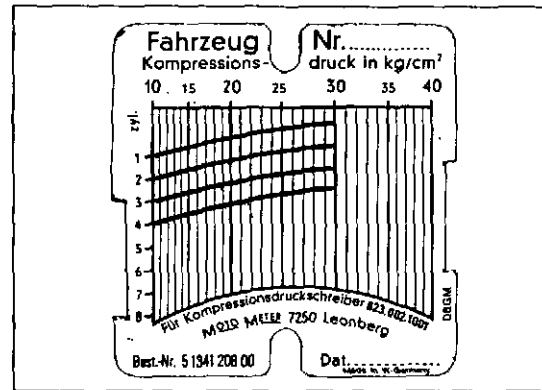
2. Fit clamping pad. Tighten bolt.



3. Connect compression tester.
Turn engine with starter.

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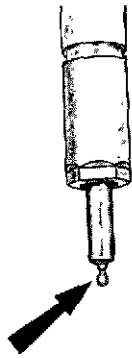
The measured compression pressure is dependent on the starting speed during the measuring process and also on the altitude of the engine site. Limiting values are therefore difficult to lay down exactly. It is recommended to use the compression pressure measurement only for comparison of compression pressures of all cylinders in one engine. If a difference in pressure exceeding 15 % is determined, the cylinder unit concerned should be dismantled to establish the cause.



Note:
For fitting injectors and injection lines see chapter 4.



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42-2.17



7. In the case of a drip, the injector must be dismantled and cleaned to remedy the leak. If this does not cure the leak, the injector must be replaced.

Reworking is not admissible.

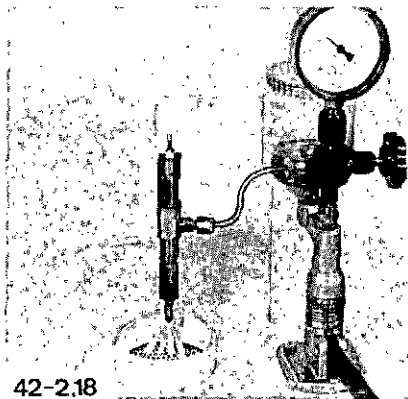
2

8. Buzzing and spray pattern test

Switch out testing outfit pressure gauge.

The buzzing test permits an audible check of the ease of movement of the nozzle needle in the nozzle body. New injectors emit a different buzzing sound as compared to used injectors. It deteriorates due to wear in the needle seat zone. If an injection nozzle does not buzz despite cleaning, it must be replaced by a new one.

A used injector should buzz clearly during rapid actuation of the handlever, while exhibiting a well atomized spray pattern. The spray pattern can differ noticeably from that of a new injector.



42-2.18



Injection pump

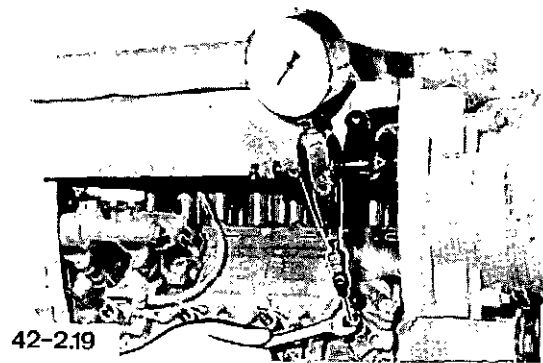
Commercial tools required:

- Injection pump tester... 3202
- Crowfoot spanner a/flats 13

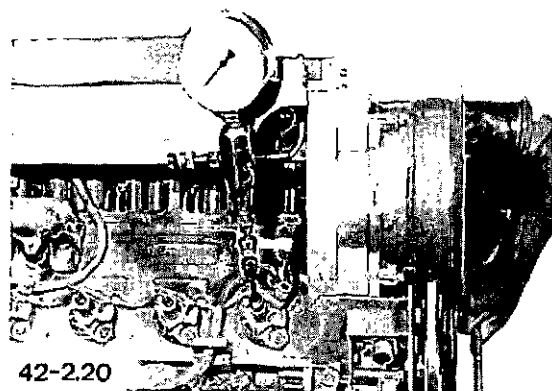
The injection pump is tested on the engine to make sure that the delivery valves and pump elements are free from leaks. For the test, it is essential that the fuel feed system is operating properly and that the fuel system is free from air.

Injection lines have been removed.

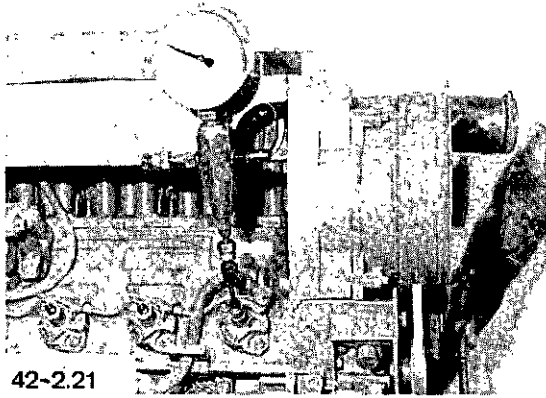
1. Connect injection pump tester to delivery valve holder.



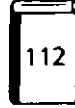
2. Turn crankshaft via V-belt pulley, while bleeding tester at the screw plug.



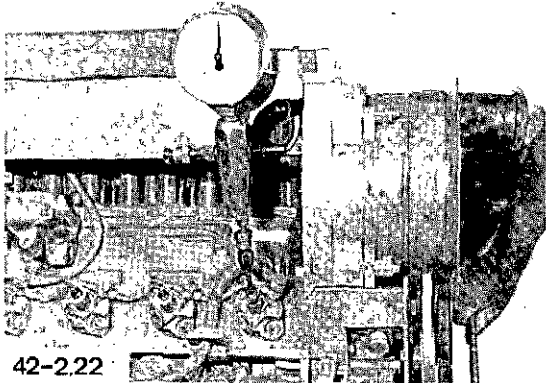
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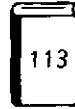
42-2.21



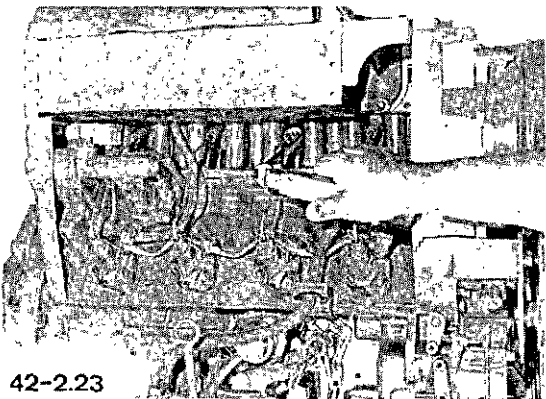
3. Turn crankshaft until a pressure of 150 bar is applied to the delivery valve. The indicated pressure should not drop more than 10 bar within one minute.



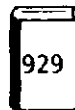
42-2.22



4. Turn crankshaft further until a pressure of 300 bar is generated. If this value is not attainable, remove injection pump.



42-2.23



5. Remove injection pump tester and reassemble engine.

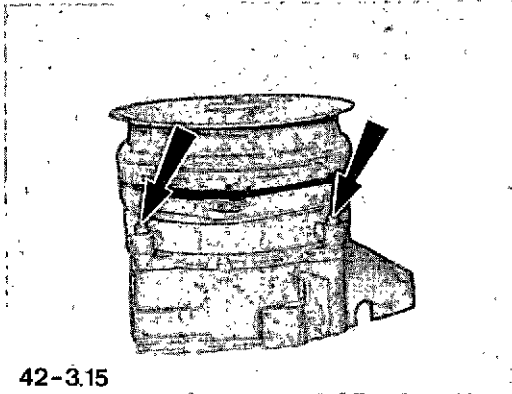
Note:
Secure injection lines in accordance with specifications.

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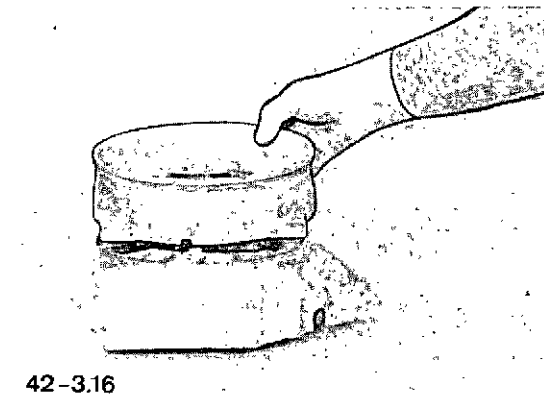
Repair of components

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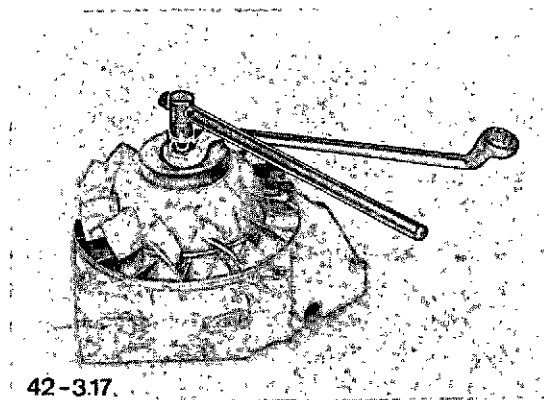


Blower

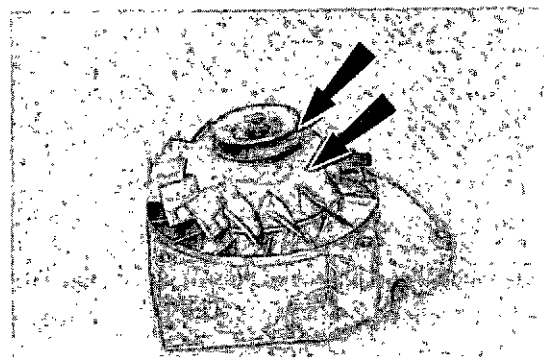
1. Remove complete air guide ring.



2. Remove blower housing inlet.

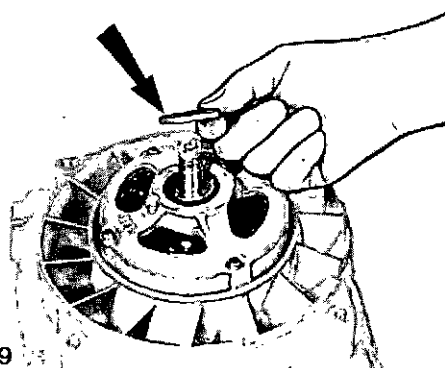


3. Undo fastening nut.



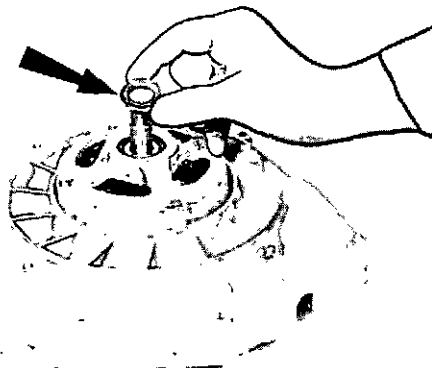
4. Lift off V-belt pulley and blower rotor.

5. Remove spacer disc.



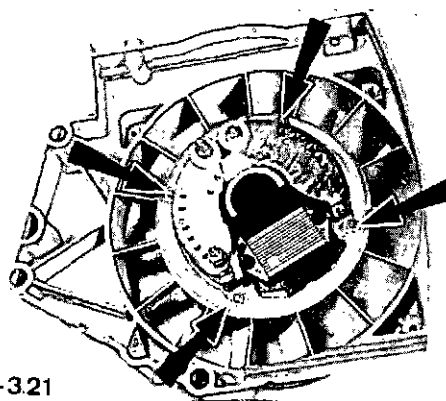
42-3.19

6. Remove guide plate.



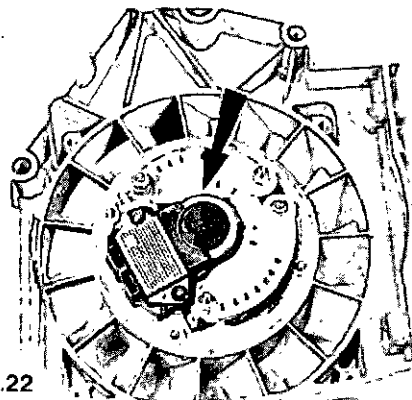
42-3.20

7. Undo fastening nuts.

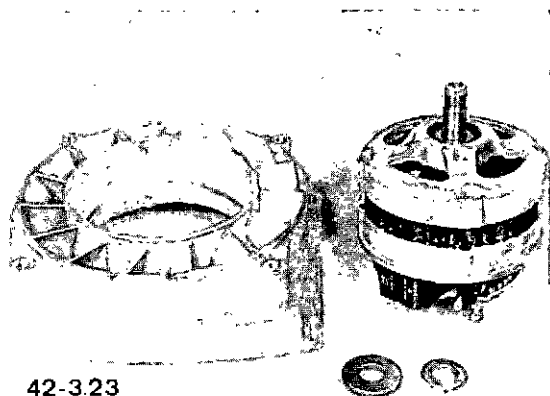


42-3.21

8. Press out alternator.



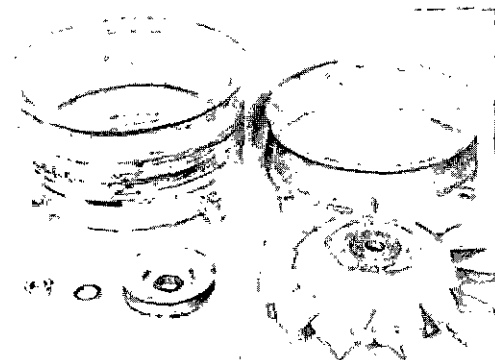
42-3.22



42-3.23



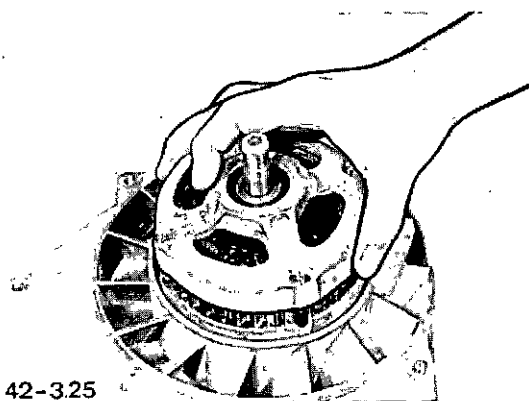
9. Inspect all parts, renew if necessary.



42-3.24



3

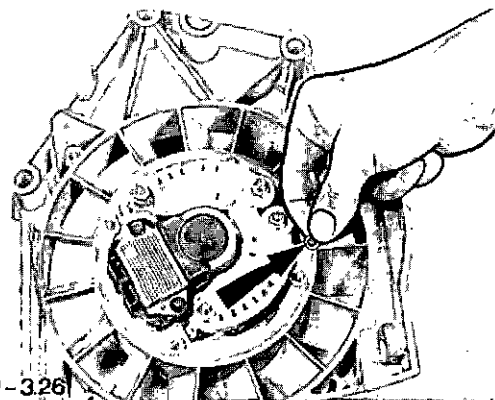


42-3.25

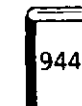


10. Install alternator in blower.

Note:
Watch direction of installation.



42-3.26



11. Position washers, tighten nuts in accordance with specifications.

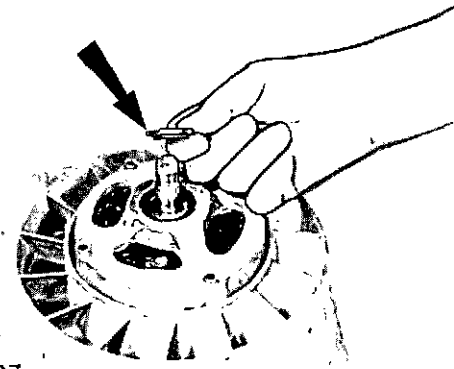
Werkstatthandbuch B/FL 1011/T

12. Place guide plate in position.

Note:
Recessed side must face towards alternator.



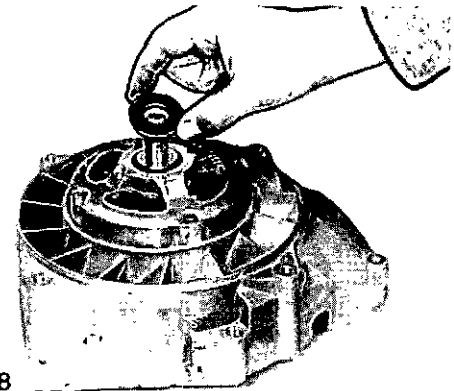
42-3.27



13. Place spacer disc in position.



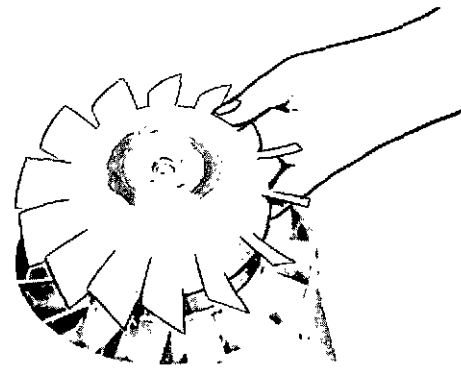
42-3.28



14. Fit blower rotor.



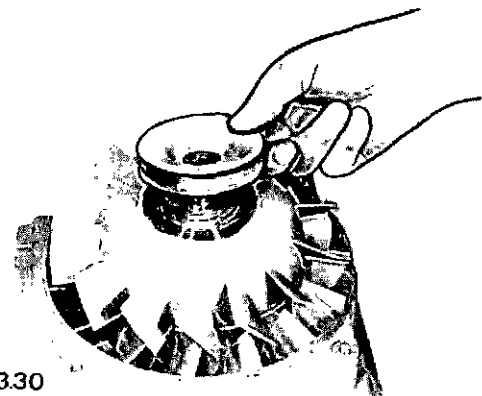
42-3.29



15. Place V-belt pulley in position.

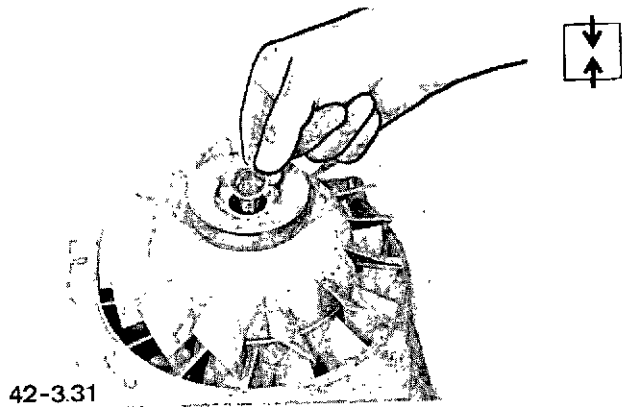


42-3.30

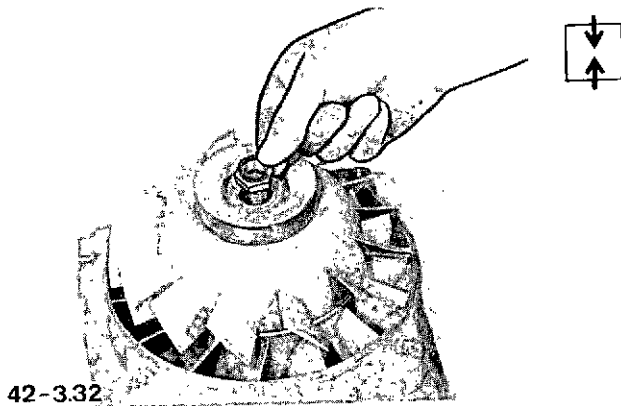


Repair of components

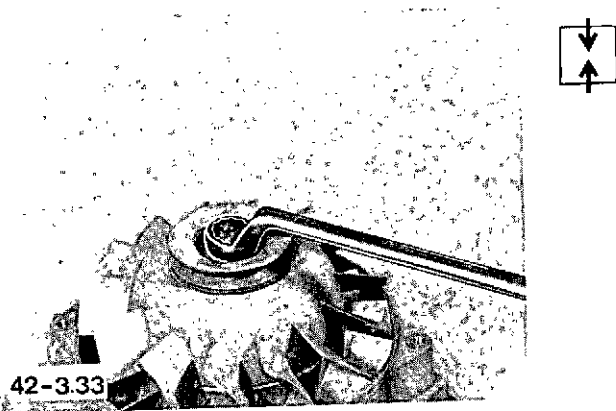
Werkstatthandbuch B/FL 1011/T



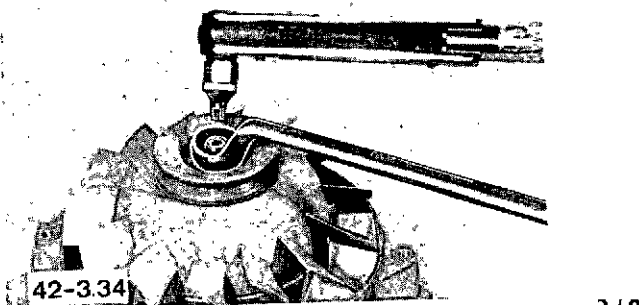
16. Position washer in place.



17. Screw on fastening nut.



18. Fix box spanner.

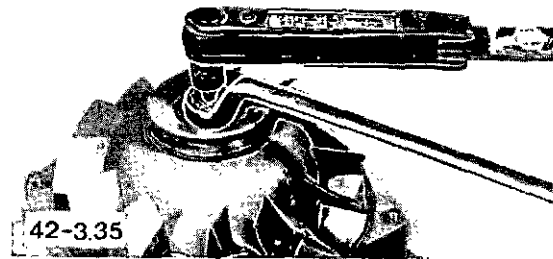
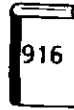


19. Insert torque spanner with hex. socket.

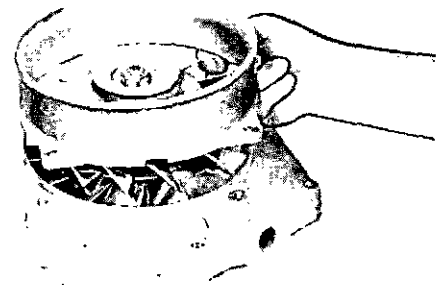
3

Werkstatthandbuch B/FL 1011/T

20. Lock down fastening nut in accordance with specifications.

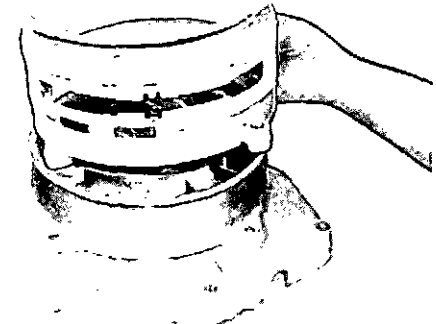


21. Fit blower housing inlet.

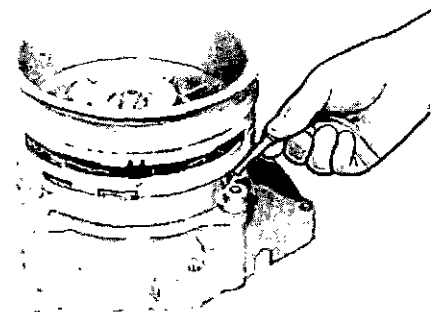


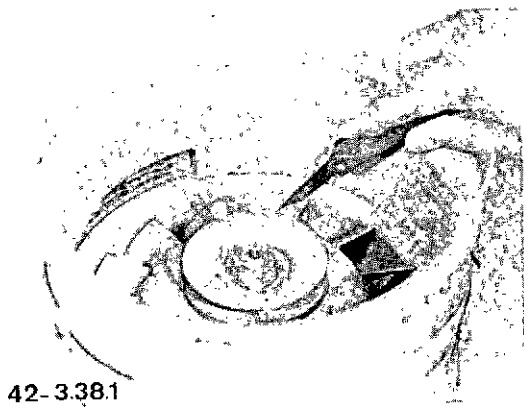
22. Fit air guide ring.

Note:
Watch direction of installation.



23. Insert and lock down fastening bolts.

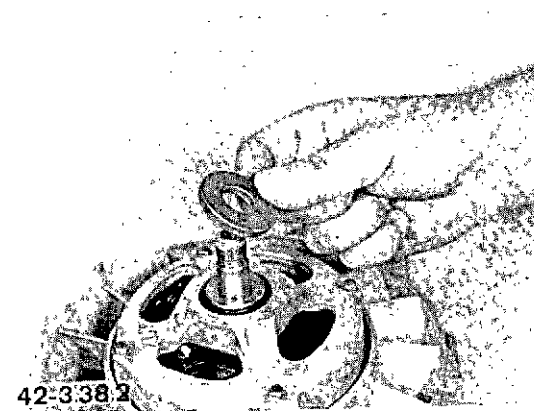




23.1 Measure gap between blower rotor and blower housing inlet.

Min. = 0.2 mm

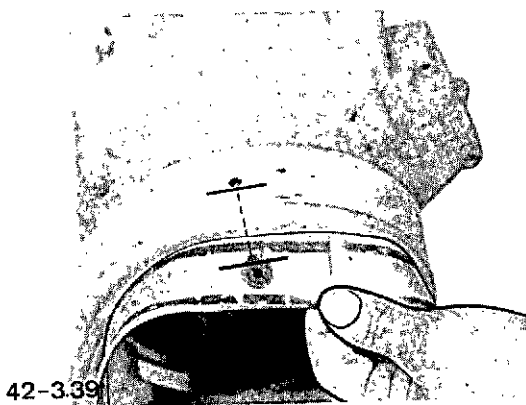
Max. = 0.8 mm



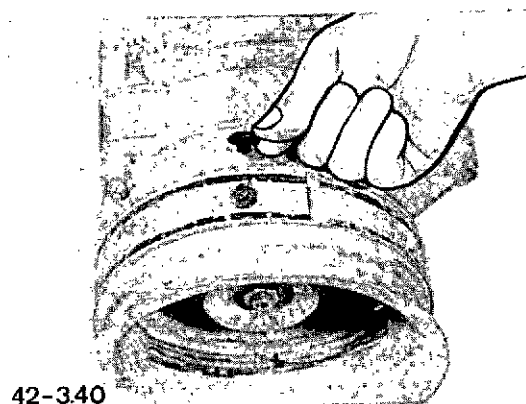
23.2 For correction use appropriate spacer discs.

Note:

Spacer discs are available from 4.0 to 7.5 mm.



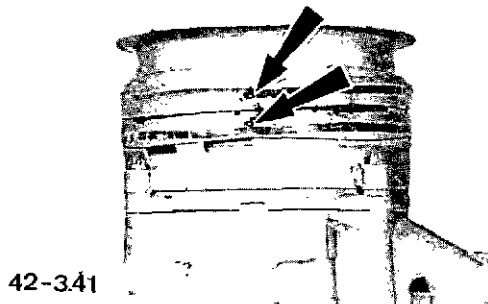
24. Fit sealing ring and make sure that bores are in line.



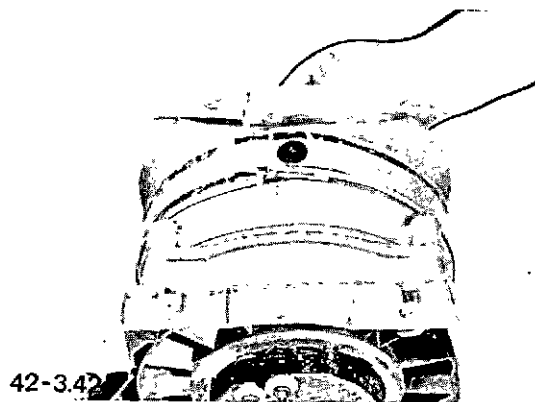
25. Press fastening knob through sealing ring into air guide ring.

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26. Press sealing ring into metal lugs.

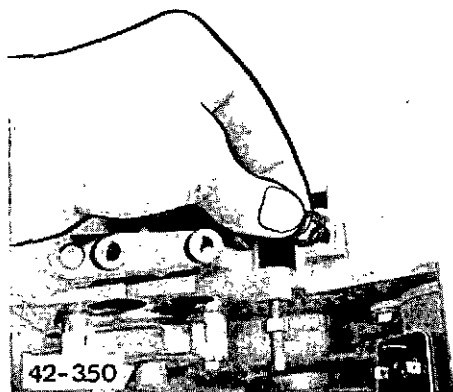


27. Fit hose clips and secure.

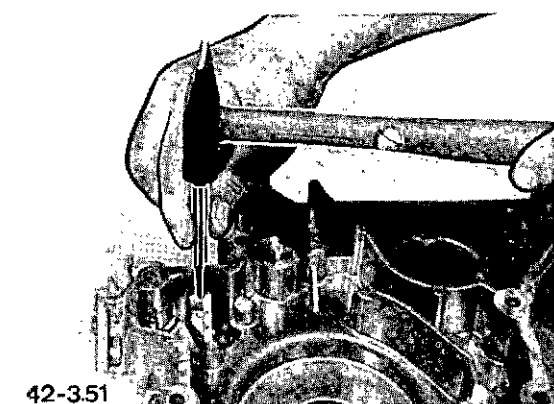


Repair of components

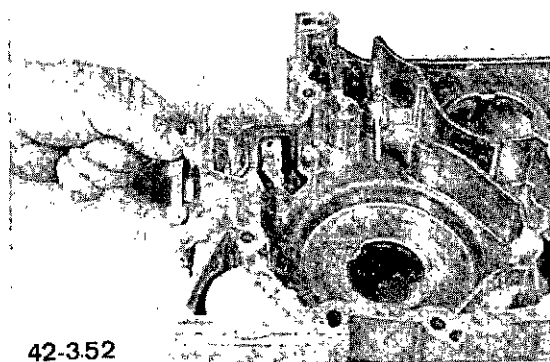
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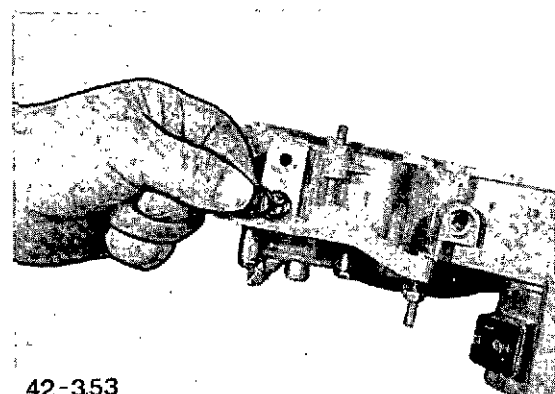
8. Remove O-seal.



9. Drive out dowel sleeve.



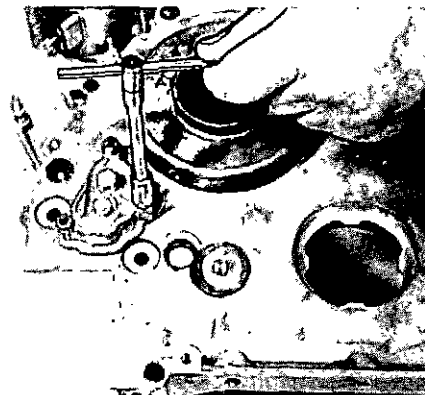
10. Remove speed control lever together with spacer bush.



11. Remove O-seal.

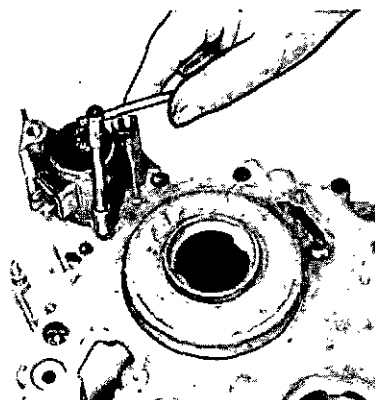
3

12. Remove cover for idle adjusting screw.



42-354

13. Remove engine shutdown lever.



42-355

Inspect front cover and renew if necessary.

14. Press in camshaft seal.



142 050

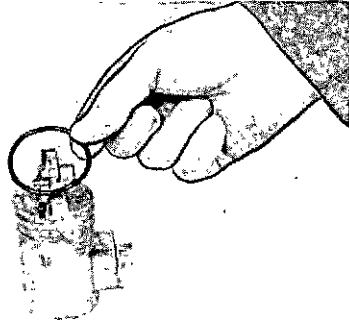
42-356

15. Press in crankshaft seal.



142 850

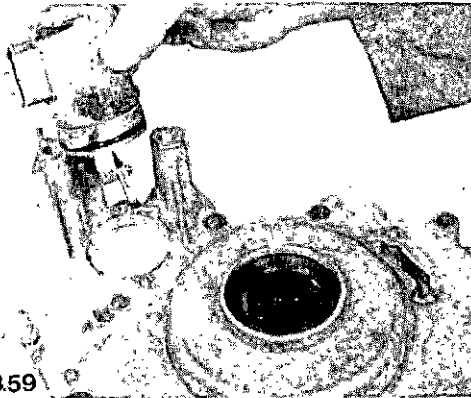
42-357



42-358



16. Place O-seal in position and apply some grease.

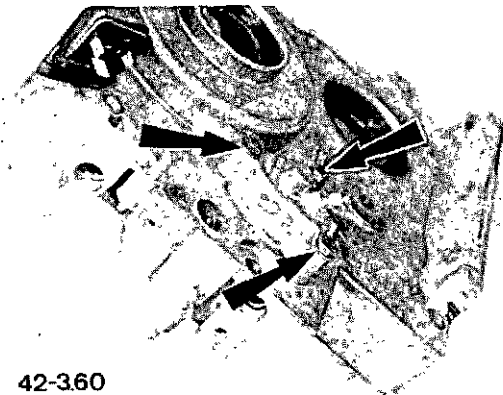


42-359



17. Refit engine shutdown lever and secure.

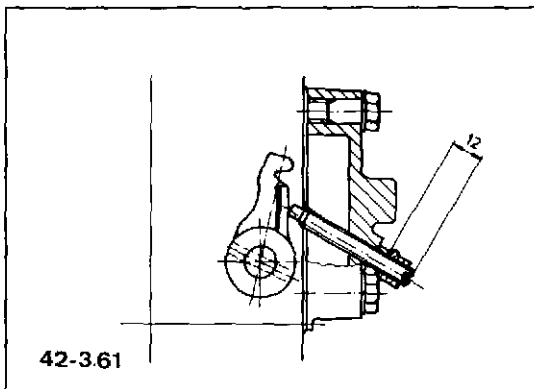
Note:
Watch direction of installation.



42-360



18. Refit cover for idle adjusting screw together with gasket and secure.



42-361

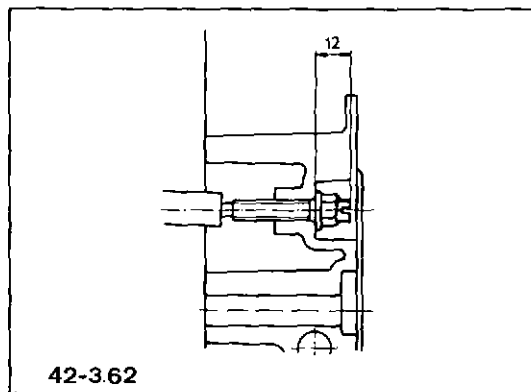


19. Adjust clearance of max. speed setscrew and tighten with sealing nut.

Distance 12 mm

20. Adjust clearance of full-load setscrew and tighten with sealing nut.

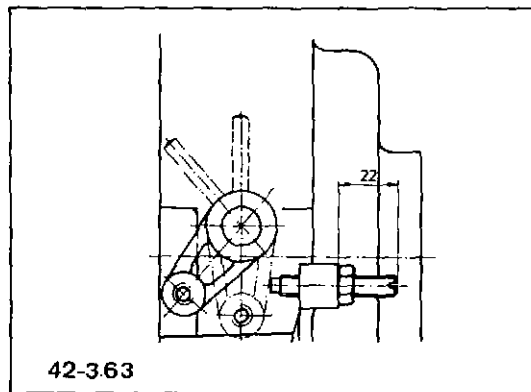
Distance 12 mm



42-3.62

21. Adjust clearance of engine shutdown stop screw and tighten.

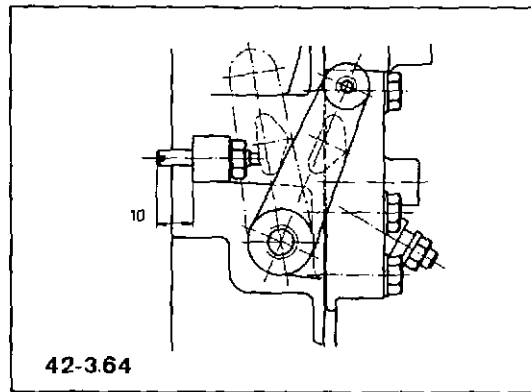
Distance 22 mm



42-3.63

22. Adjust clearance of min. speed setscrew and tighten.

Distance 10 mm

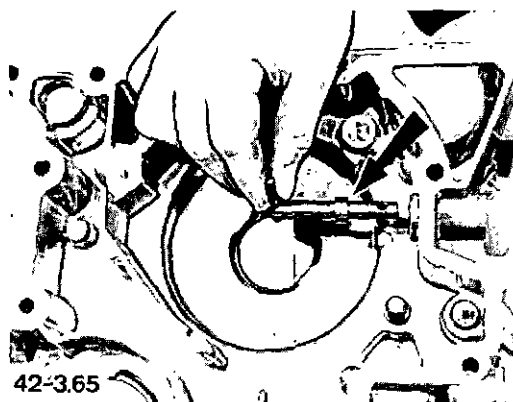


42-3.64

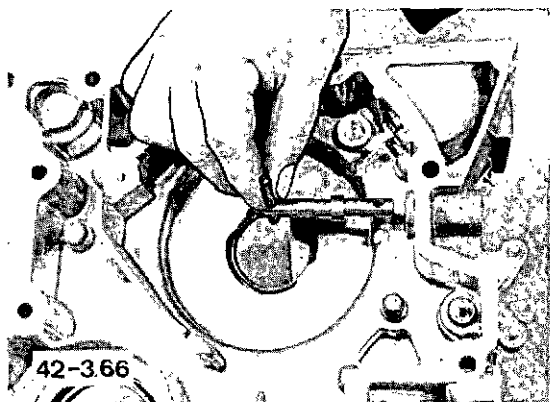
Note:

It is necessary to carry out a test run for setting engine power and speed.

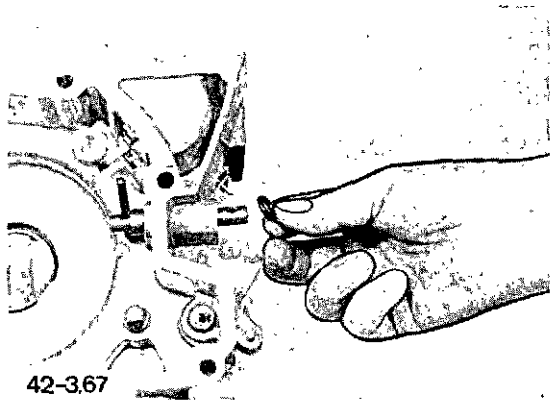
23. Slide spacer bush over shut-down shaft.



42-3.65



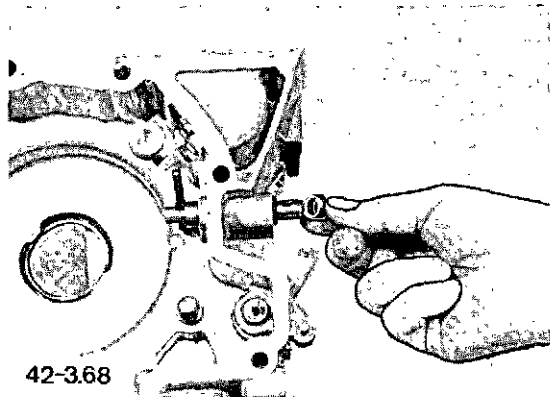
24. Fit shutdown shaft.



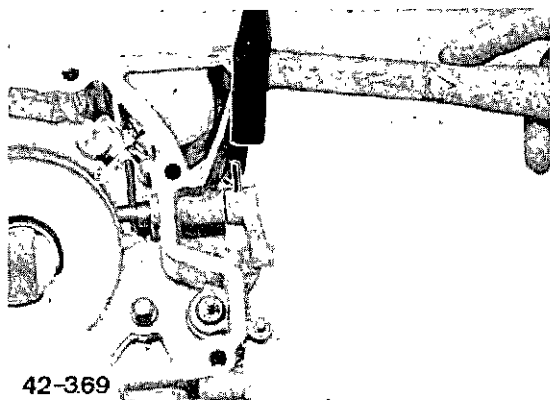
25. Slide greased O-seal over shaft.



3



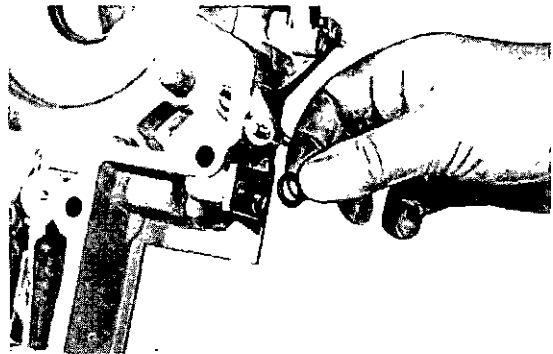
26. Slide over spacer bush.



27. Fit shutdown lever with dowel sleeve.

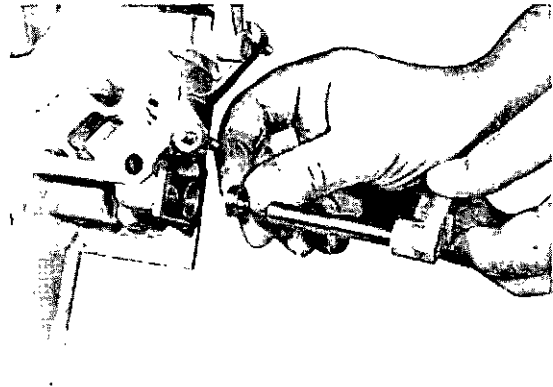
Werkstatthandbuch B/FL 1011/T

28. Fit greased O-seal.

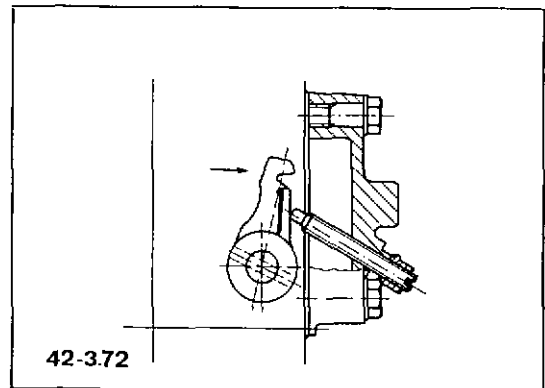


42-370

29. Fit spacer bush on drive shaft and press in.

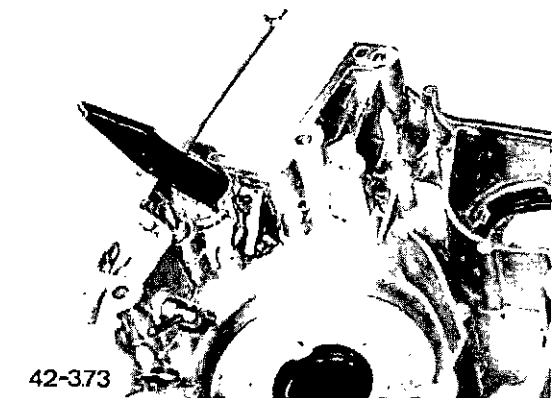


Note:
Watch direction of installation of speed control lever.

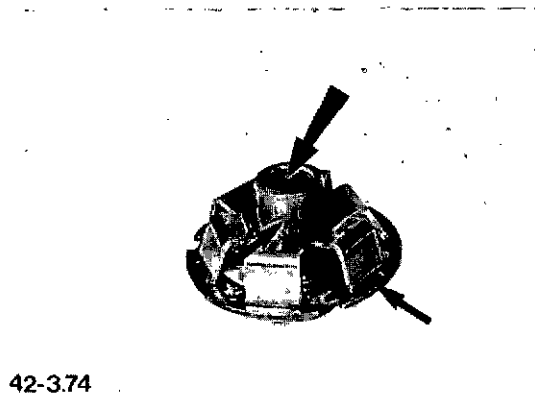


42-372

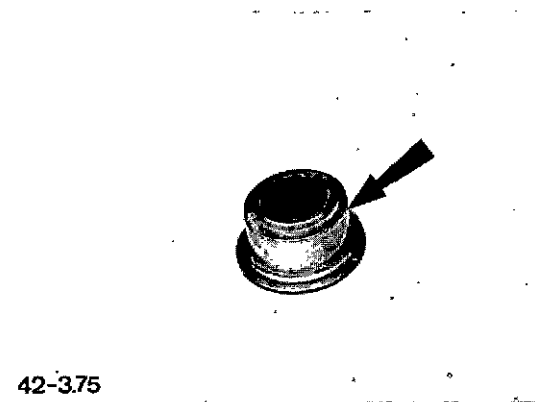
30. Fit speed control lever with dowel sleeve.



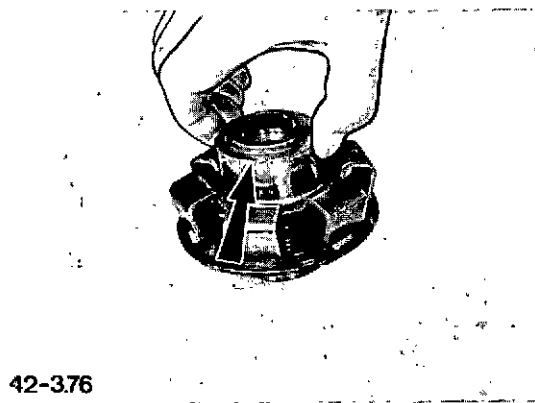
42-373



31. Inspect centrifugal governor for wear.



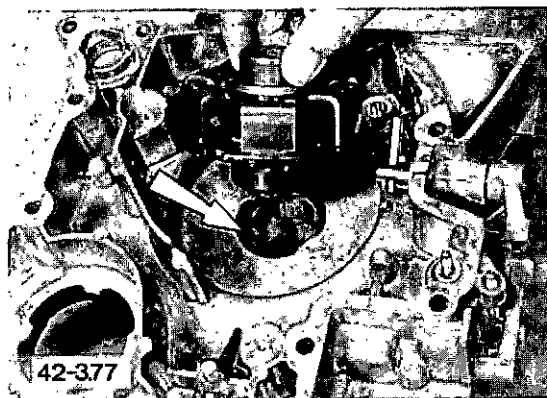
32. Inspect governor plate.



33. Fit governor plate together with centrifugal governor.



Note:
Watch direction of installation.



34. Install centrifugal governor in front cover.

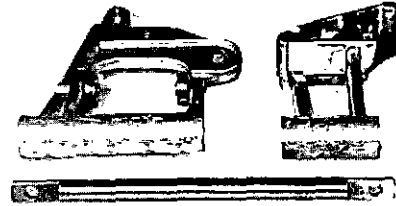


Note:
Be careful not to damage sealing lip of shaft seal.

3

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35. Inspect governor lever, shaft, and governor lever stop.

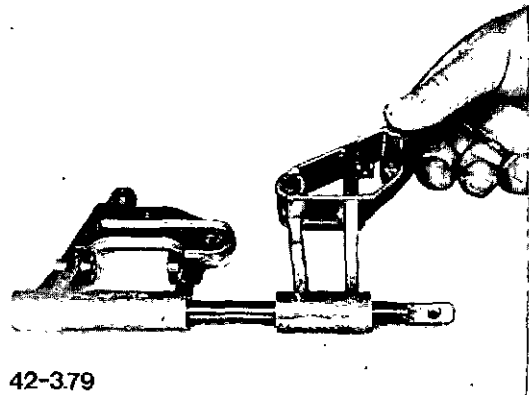


42-378

36. Fit governor lever together with governor lever stop and shaft.



Note:
Watch direction of installation.

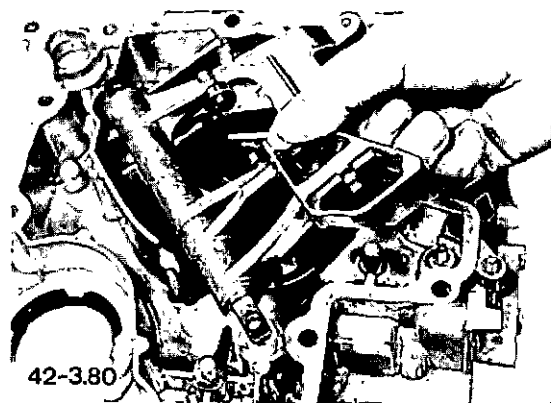


42-379

37. Install complete governor lever shaft in front cover and secure.

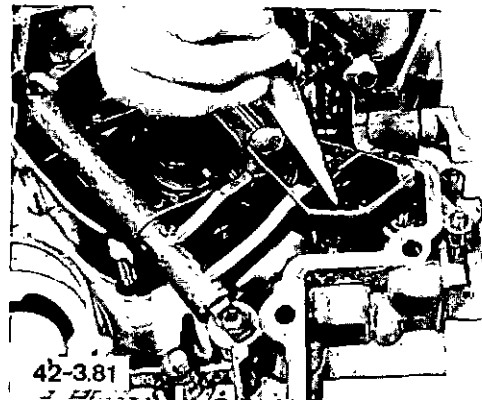


Note:
Check governor lever for free movement.

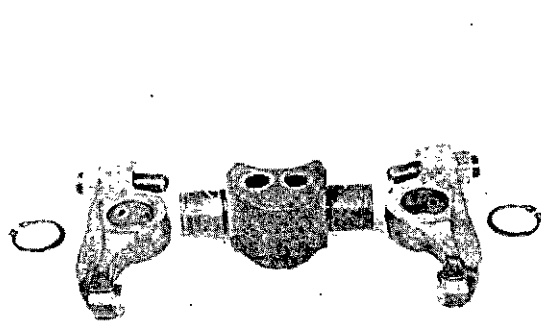


42-380

38. Hook up governor spring.



42-381

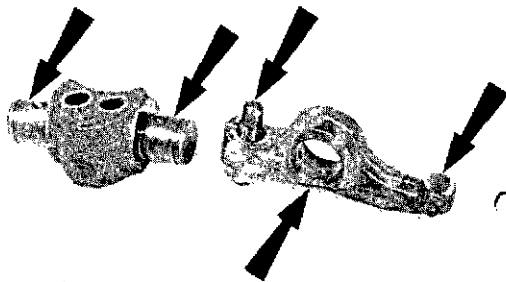


42-3.82



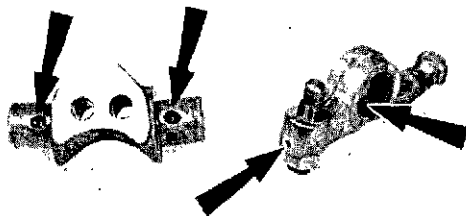
Rocker arm bracket

1. Dismantle rocker arm bracket.



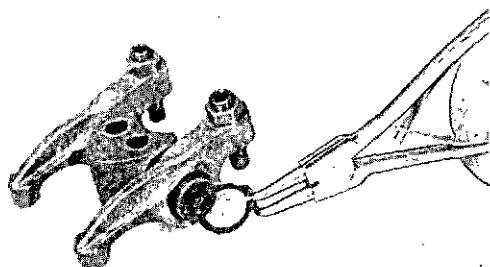
42-3.83

2. Check journals, adjusting screw, rocker arm contact face and bore for wear.



42-3.84

3. Check oil duct for free passage.

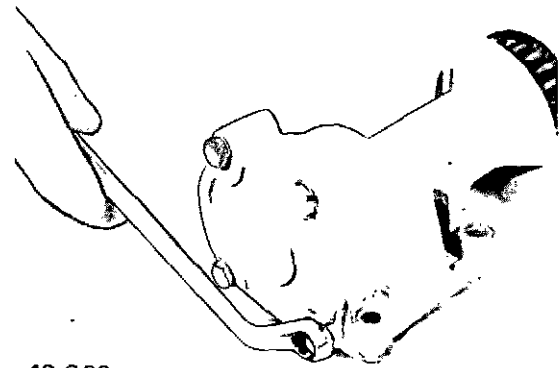


42-3.85

4. Reassemble rocker arm bracket. Fit circlips.

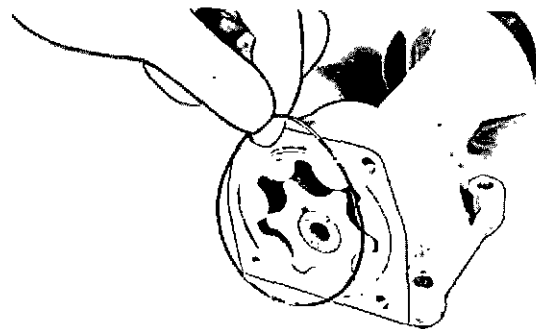
Lube oil pump

1. Remove cover.



42-3.86

2. Refit cover with new O-seal.

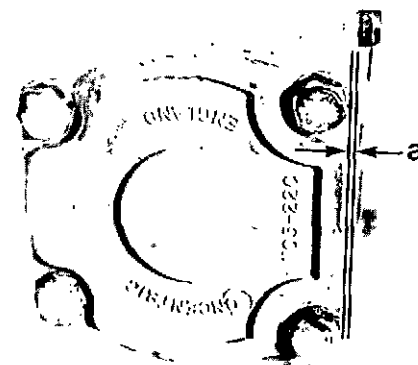


42-3.87

Note:

When fitting cover clearance „a“ must be observed.

„a“ = min. 0.5 mm.



42-3.88

4. Renew lube oil pump if damaged.

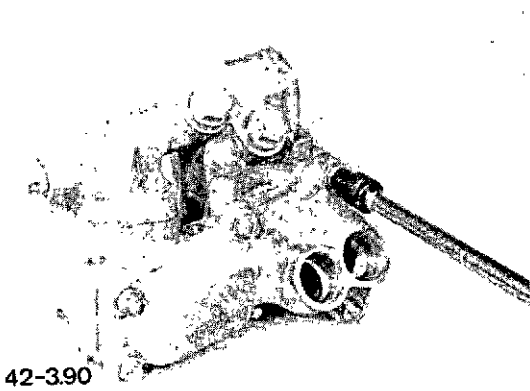


42-3.89

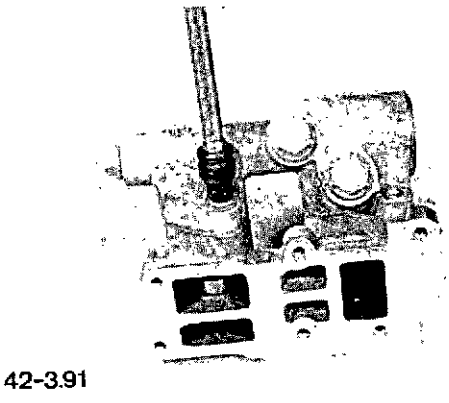
Thermostat housing

Commercial tools required:
Screw driver with socket

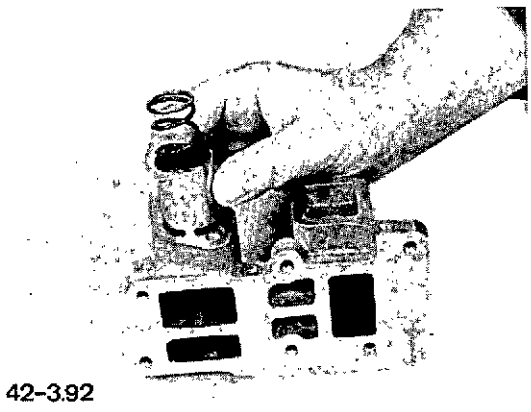
3



1. Lift off cover. Remove steel gasket.



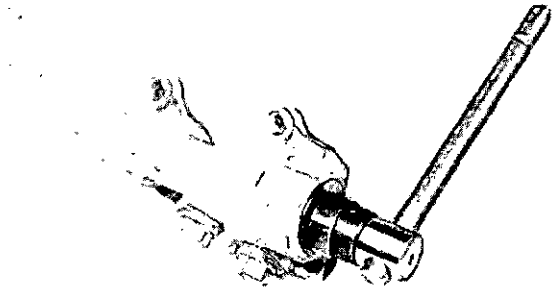
2. Remove valve plunger housing.



3. Take out thermostat together with spring.

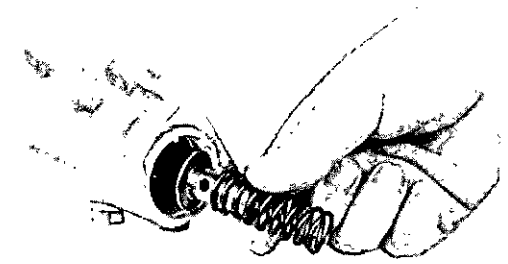
4. Remove screw plug for valve plunger.

Note: Heat up screw plug.



42-393

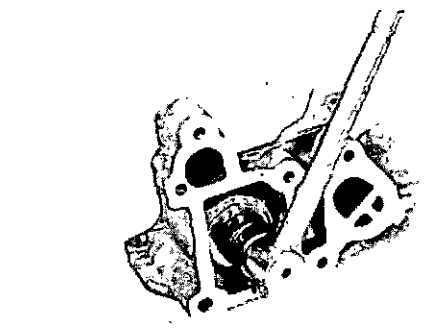
5. Remove valve plunger together with compression spring.



42-394

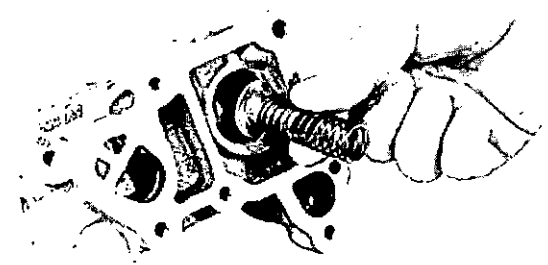
6. Remove screw plug for valve plunger.

Note: Heat up screw plug 150° C.

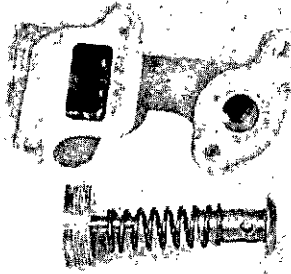


42-395

7. Remove valve plunger together with compression spring.

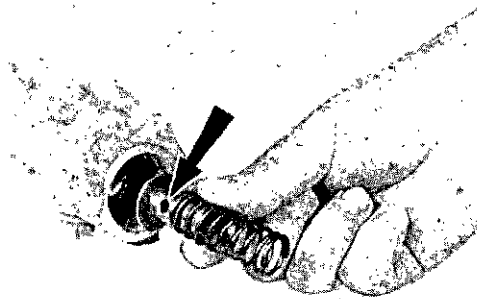


42-396



42-397

8. Inspect individual component parts.

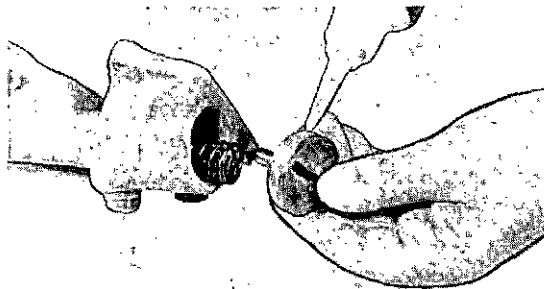


9. Refit valve plunger together with compression spring.

Note:
Watch bypass bore.



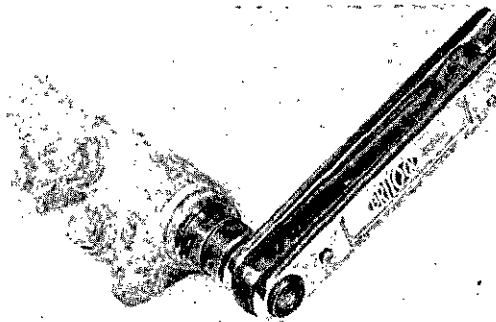
42-398



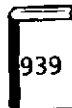
10. Spread thread of screw plug with sealing compound Loctite 648.



42-399



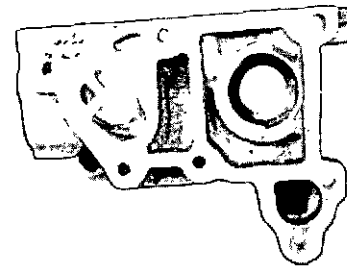
11. Tighten screw plug in accordance with specifications.



42-3:100

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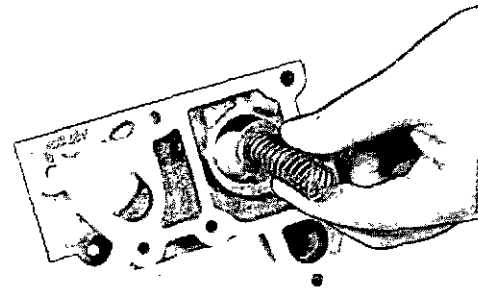
12. Inspect individual component parts.



42-3.101

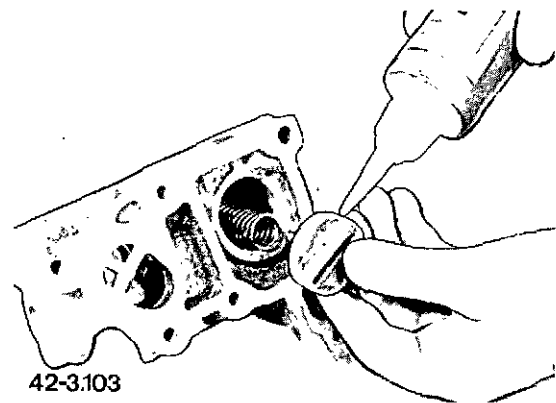


13. Refit valve plunger together with compression spring.



42-3.102

14. Spread thread of screw plug with Loctite 648.

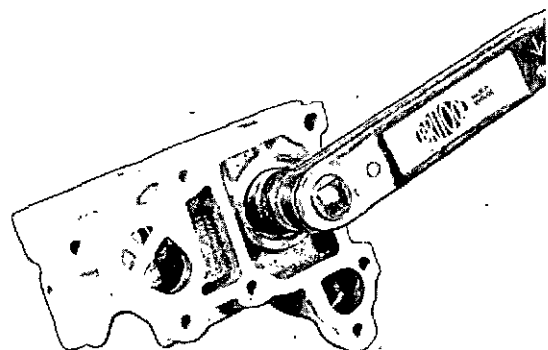


42-3.103

15. Tighten screw plug in accordance with specifications.



939



42-3.104

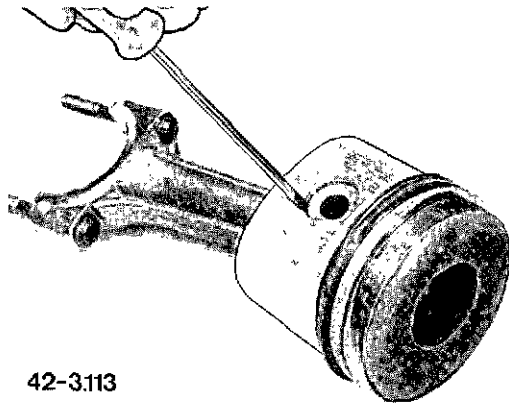
Piston and connecting rod

Special tools required:

Piston ring pliers 130300

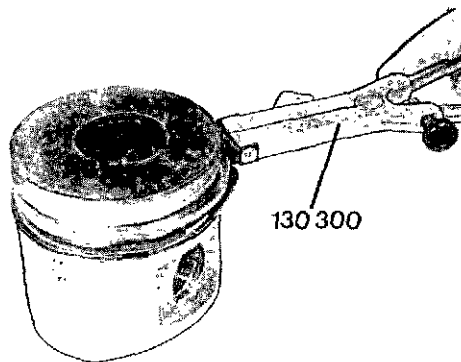
Assembly device for

small end bush 131340



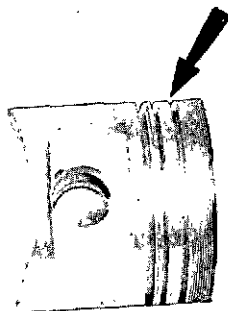
1. Remove circlip. Take out piston pin.

3



2. Adjust piston ring pliers to piston diameter. Remove piston rings.

42-3.114



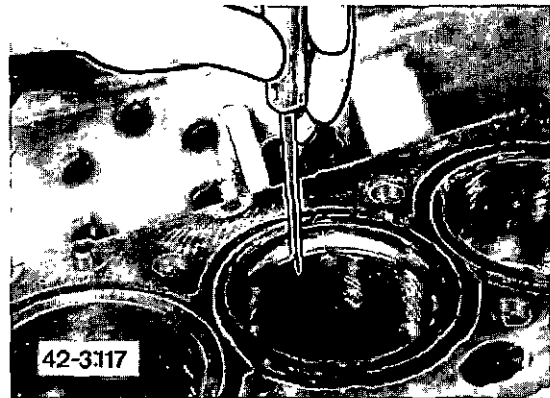
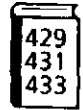
3. Clean and inspect piston and ring grooves.

42-3.115

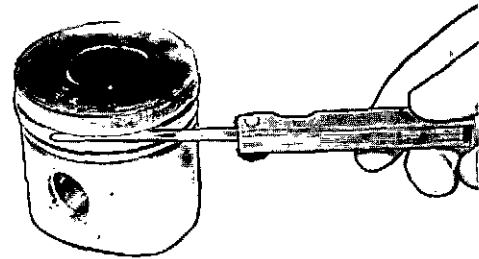
Werkstatthandbuch B/FL 1011/T

4. Measure ring gap with feeler gauge.

Note:
Gauge with new piston rings fitted.

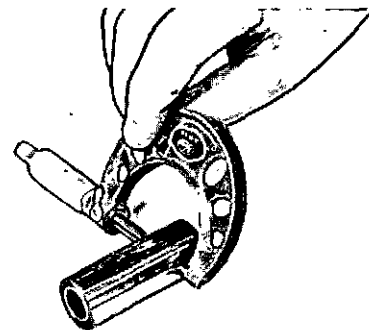


5. Measure ring grooves with feeler gauge.



42-3116

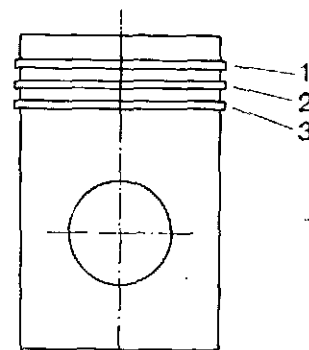
6. Check piston pin for wear.



42-3118

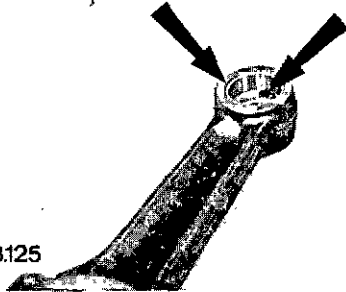
7. Order and position of piston rings:

1. Rectangular ring
On BF-engines: keystone ring
2. Tapered compression ring
(top facing comb.chamber)
3. Bevelled-edge slotted oil control ring



42-3119

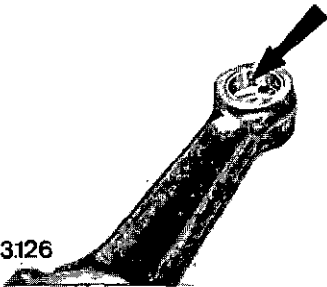
42-3125



12. Lube oil bores of small end bush and connecting rod must be in line.

Note:
Press in small end bush flush.

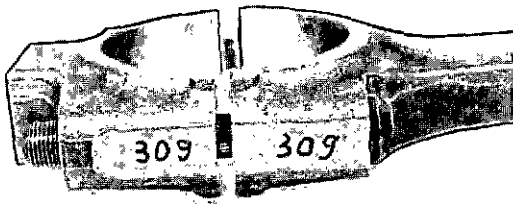
42-3126



13. After pressing in, precision-bore small end bush on a fine boring mill.

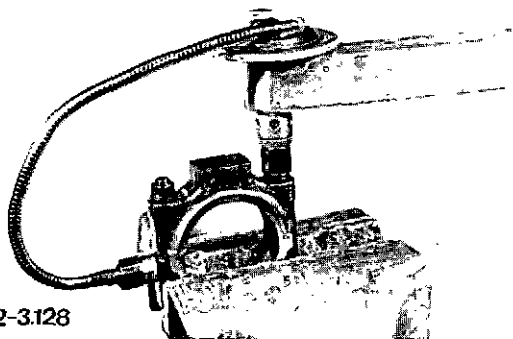
3

42-3127



14. Make sure that cap mates with connecting rod.

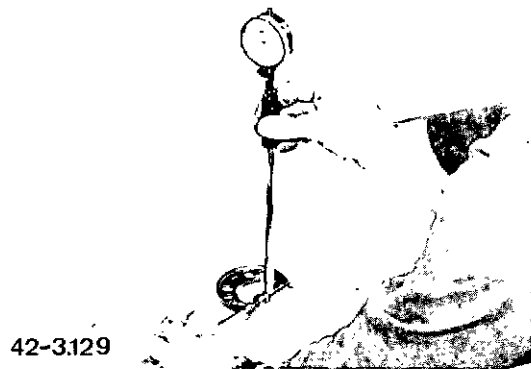
42-3128



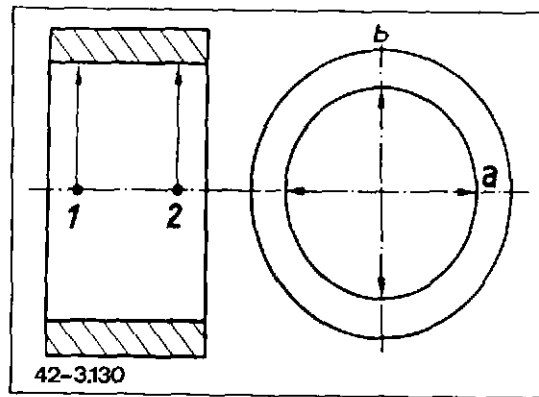
15. Mount bearing cap. Tighten nuts with **12-point socket spanner** in accordance with specifications.

Note:
Clamp connecting rod in vise at big end.

16. Set internal dial gauge.



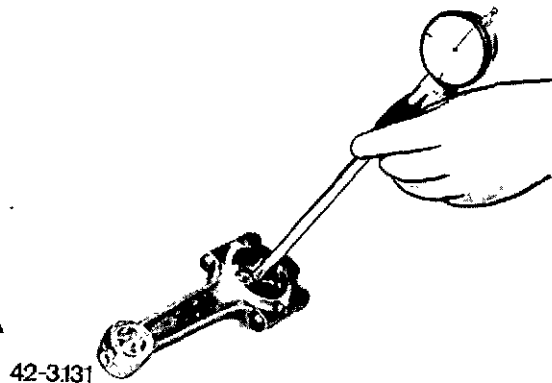
17. Diagram for gauging big end bearing bore at points 1 and 2 in planes „a” and „b”.



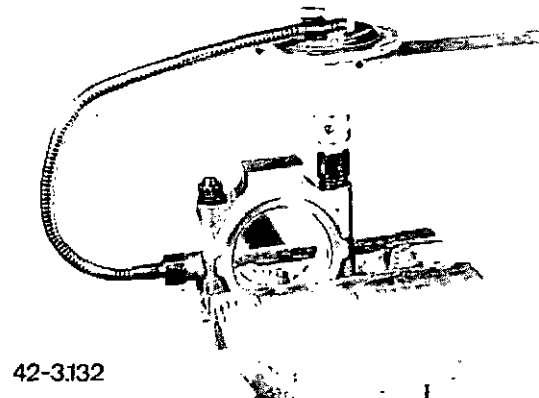
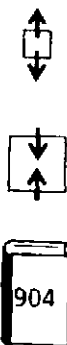
18. If the gauge readings conform to the specified values, the necessary preload will be obtained after fitting the bearing shells.

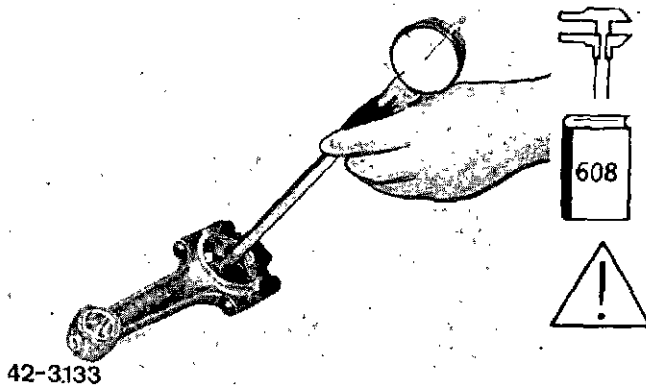
Note:

If the measured values deviate only slightly, additional measurements are to be carried out with new bearing shells fitted.



19. Remove bearing cap and fit new bearing shells. Refit bearing cap. Tighten nuts in accordance with specifications.

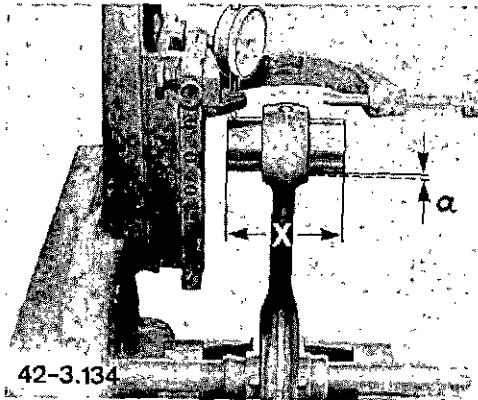




20. Adjust internal dial gauge. Gauge bearing shells at points 1 and 2 in planes „a“ and „b“.

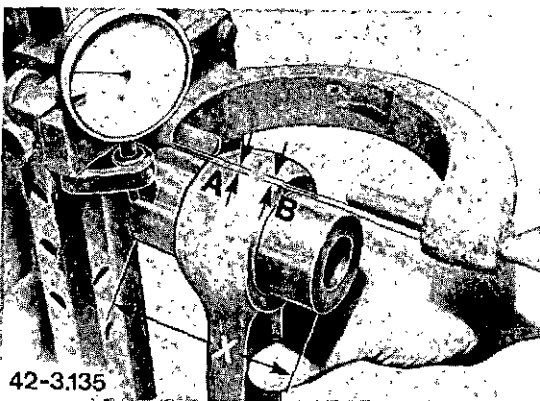
Note:

If the readings do not exceed bearing tolerances by more than **0.015 mm** the rod can be kept in use. If the limit value is exceeded, replace connecting rod.



21. Check connecting rod without bearing shells on connecting rod tester.

21.1 Parallelism check: Permissible tolerance $a = 0.10$ mm over a distance $x = 100$ mm.

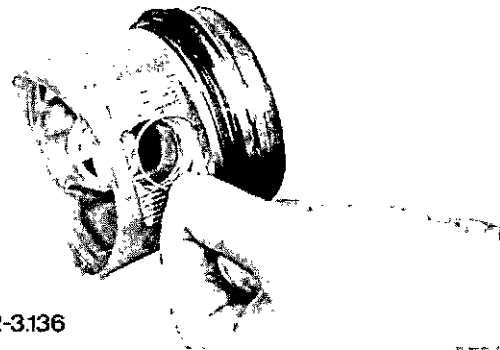


21.2 Squareness check:

Permissible tolerance „A“ relative to „B“ = 0.08 mm.

Assembling connecting rod with piston

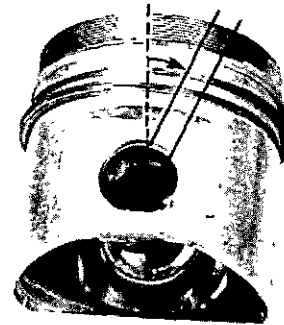
22. Fit circlip.



42-3.136

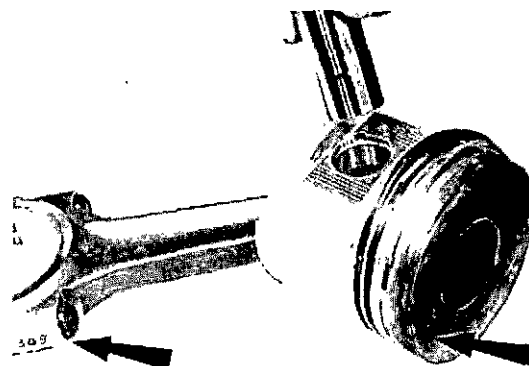
Note:

Ring gaps of circlips must face towards piston crown.



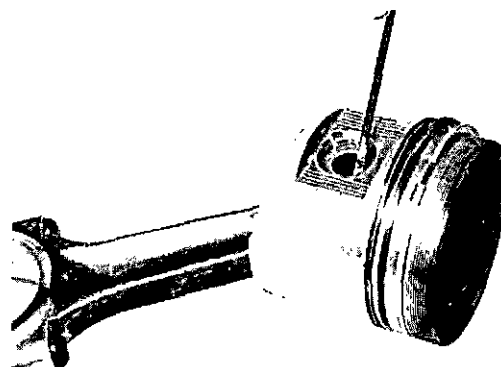
42-3.137

23. Install piston together with connecting rod. Flywheel symbol on the piston must point to the left and identification number on connecting rod must be visible.

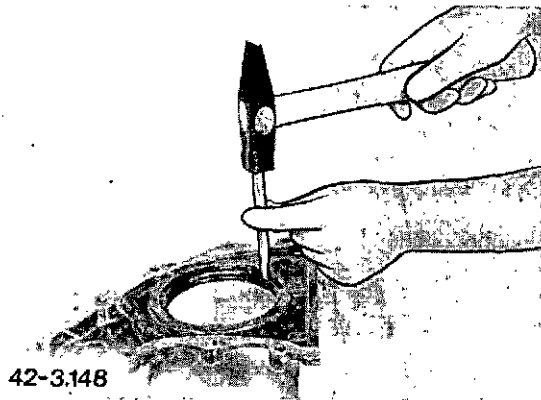


42-3.138

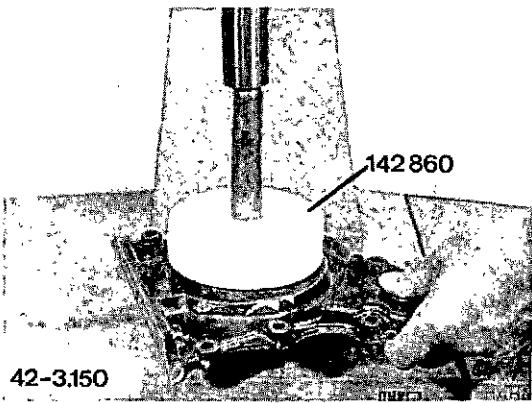
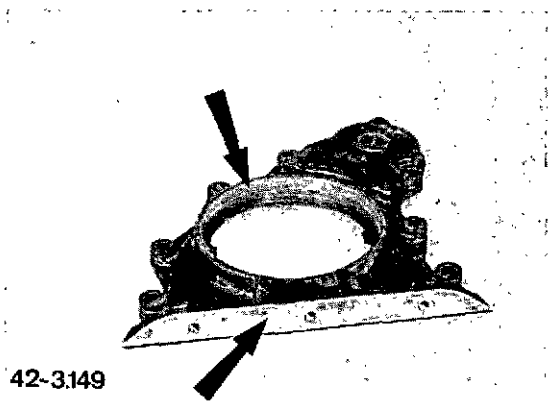
24. Fit second circlip and bring into correct position.



42-3.139



3



Rear cover

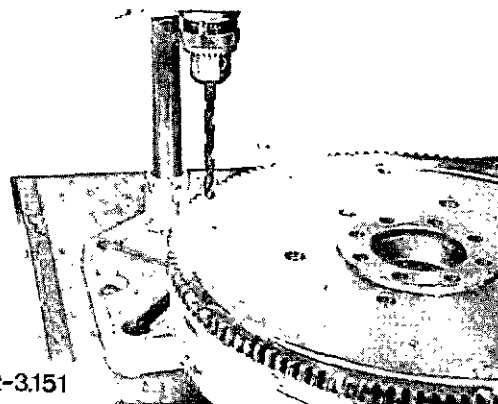
Special tools required:

Assembly tool 142860

1. Drive out shaft seal.
2. Inspect cover and replace as necessary.
3. Fit shaft seal with assembly tool.

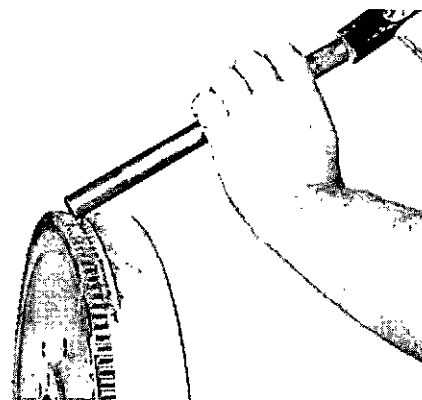
Starter ring gear/flywheel

1. Drill ring gear apart.



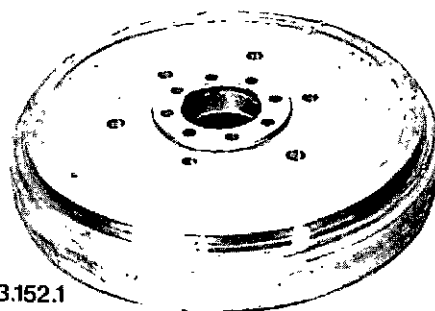
42-3.151

2. Remove ring gear.



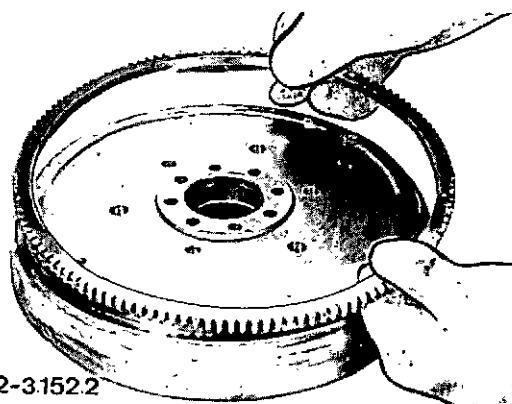
42-3.152

3. Clean flywheel and inspect at supporting flange.



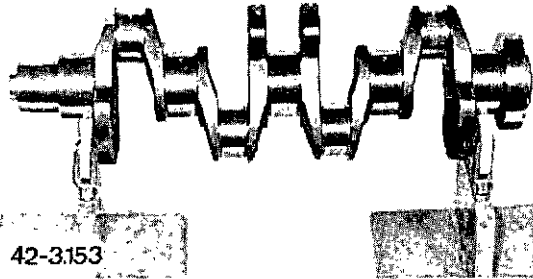
42-3.152.1

4. Heat ring gear to max. 220° C. Place ring gear in position and bring to stop at flange.

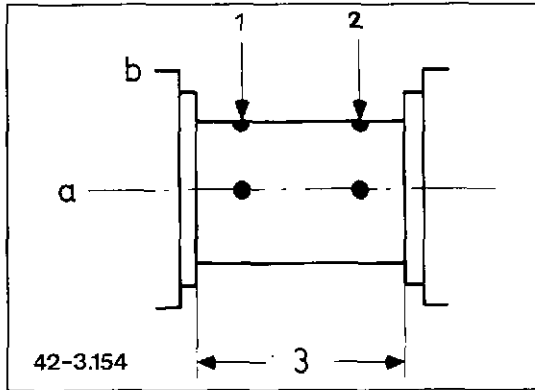


42-3.152.2

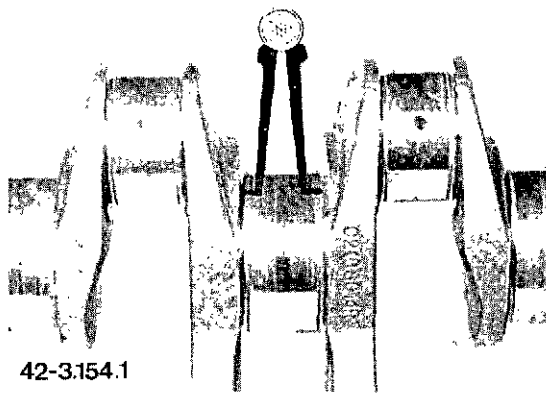
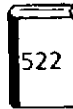
Crankshaft



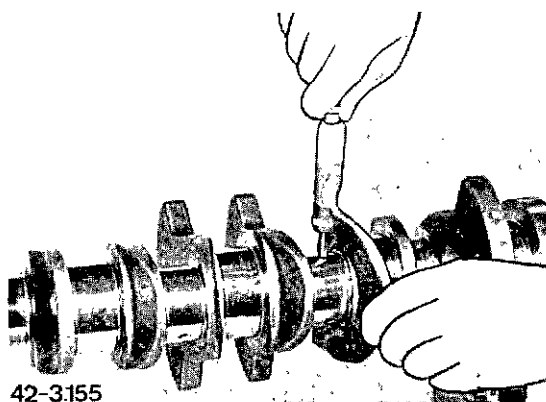
1. Chuck crankshaft up on prism stand.



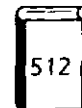
2. Diagram for gauging main bearing journals at points „1“ and „2“ in planes „a“ and „b“.



3. Gauge width of thrust bearing journal.



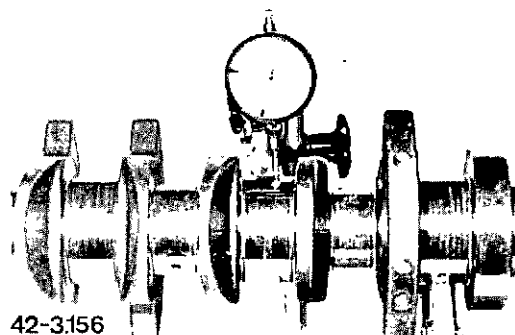
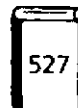
4. Gauge crankpin.



3

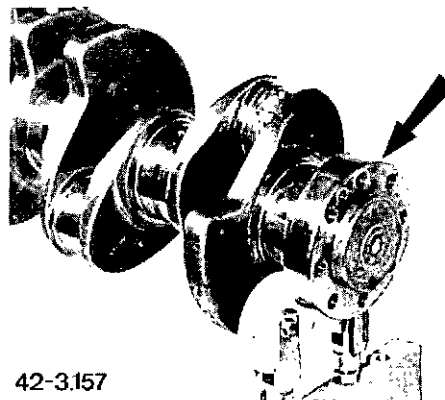
Werkstatthandbuch B/FL 1011/T

5. Check crankshaft for true running.



42-3.156

6. Inspect running surfaces of shaft seals.

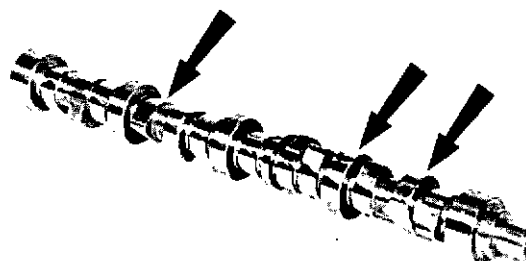


42-3.157

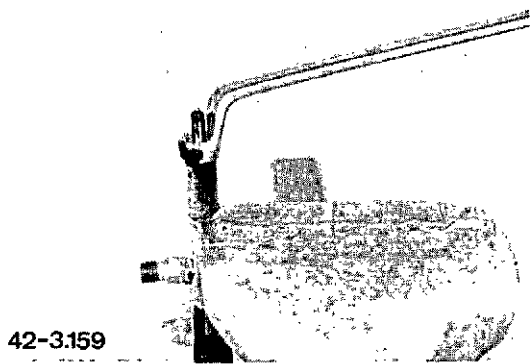
3

Camshaft

1. Check cams and bearing journals for wear.



42-3.158

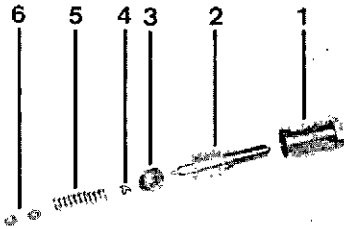


42-3.159



Injector

1. Undo cap nut.



42-3.160

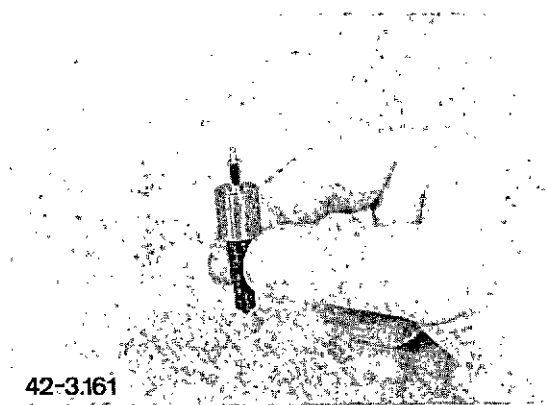


2. Sequence of parts reassembly

1. Cap nut
2. Injection nozzle
3. Intermediate pieces
4. Thrust pin
5. Compression spring
6. Shims



Wash all parts in clean diesel fuel and blow out with compressed air.



42-3.161



3. Nozzle needle and nozzle body are lapped together and may neither be confused nor exchanged individually. Do not touch nozzle needle with your fingers. When nozzle body is held in upright position, nozzle needle should by its own weight slide down slowly and smoothly on its seating.



Note:

If nozzle needle does not slide down smoothly, wash injection nozzle again in diesel fuel. Renew, if necessary. New injection nozzle must likewise be washed in clean diesel fuel.

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4. Check seating faces of intermediate piece for wear. Make sure that centering pins are fitted.



42-3.162

5. Insert shims.



Note:
The ejecting pressure is dependent on the shims.



42-3.163

6. Insert compression spring.



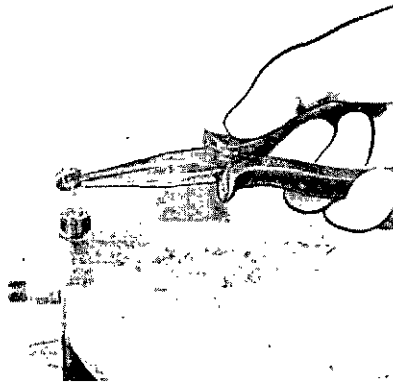
42-3.164

7. Insert thrust pin with centering collar facing towards the spring.



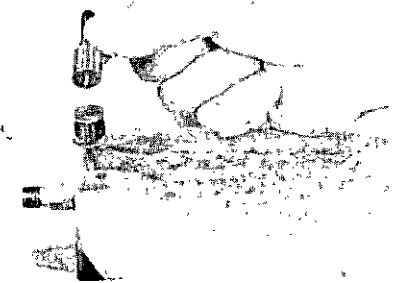
42-3.165

42-3.166



8. Insert intermediate piece with centering pins fitting into the bores in the nozzle holder.

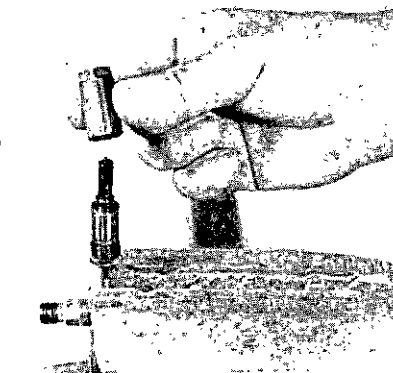
42-3.167



9. Fit injection nozzle with center bores mating with the centering pins of the intermediate piece.

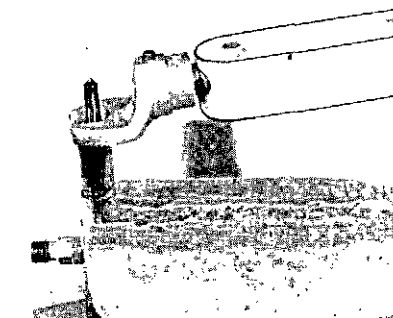
Note:
Take care that nozzle needle does not fall out of nozzle body.

42-3.168



10. Screw on cap nut.

42-3.169



11. Tighten cap nut in accordance with specifications.

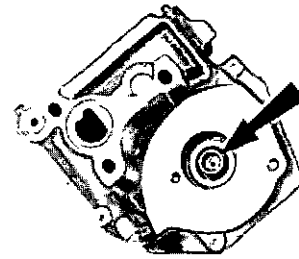
For testing and adjusting injector see chapter 2.

3

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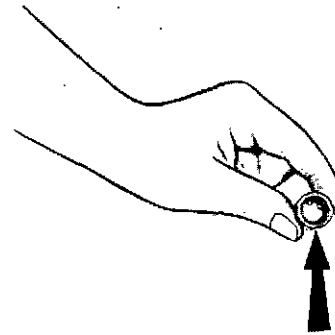
Hydraulic pump bracket

1. Remove coupling sleeve.



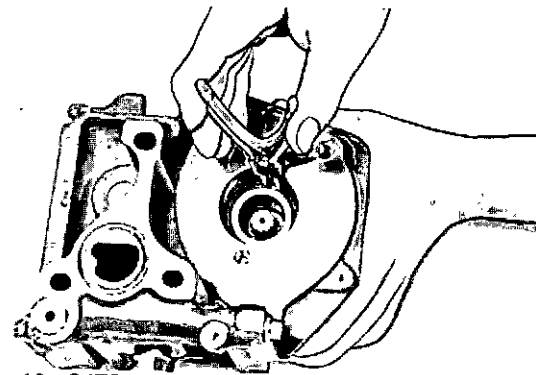
42-3.170

2. Remove circlip.



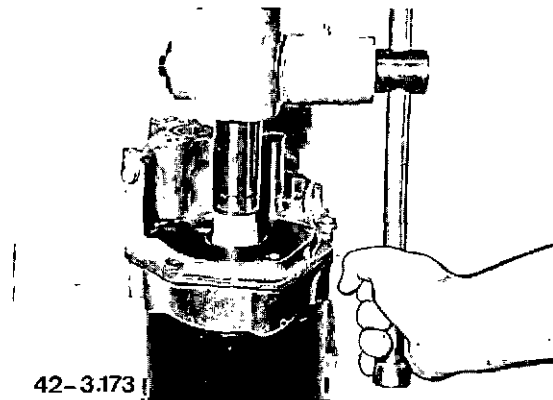
42-3.171

3. Remove circlip.

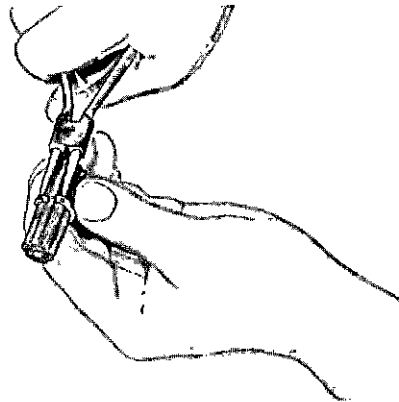


42-3.172

4. Push out hydraulic pump gear.



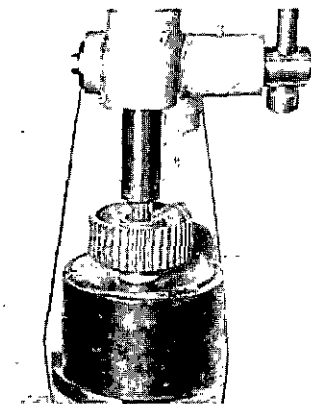
42-3.173



42-3.182



13. Insert circlip in groove on toothed shaft.



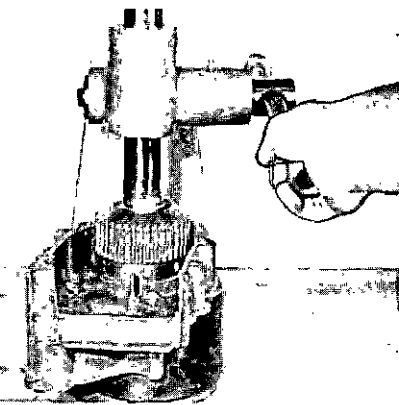
42-3.183



14. Push in serrated shaft with *graphite grease*.

Note:
Observe circlip.

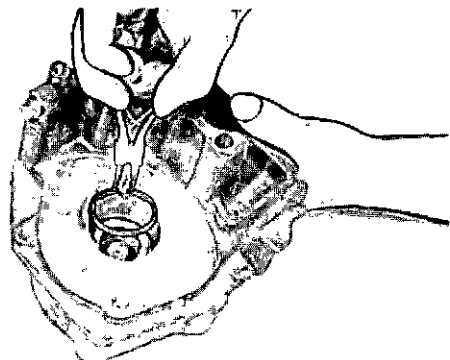
3



42-3.184



15. Push in hydraulic pump gear.

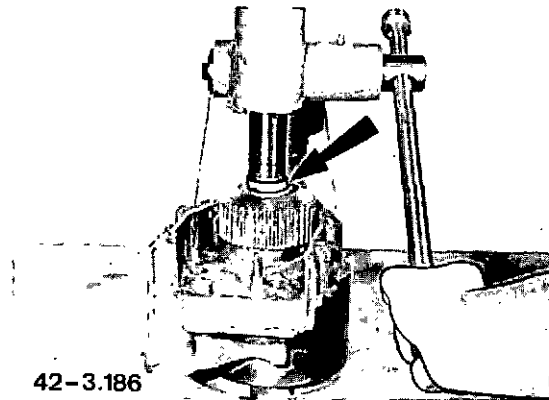


42-3.185

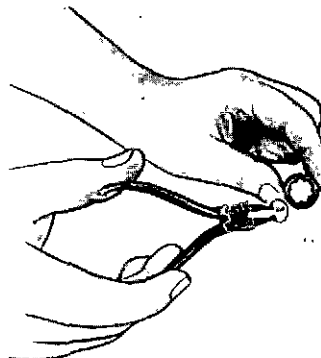


16. Insert circlip.

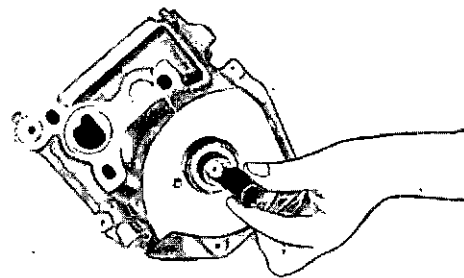
17. Press cover down.



18. Insert circlip.

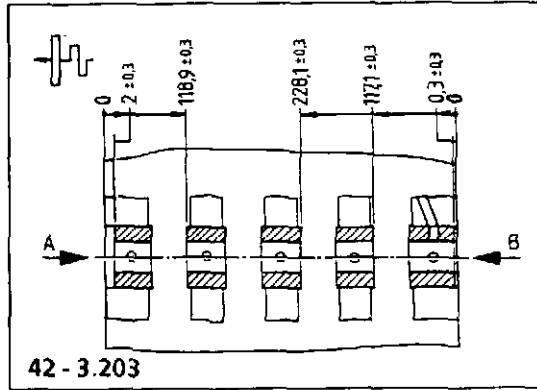


19. Insert coupling sleeve with graphite grease.



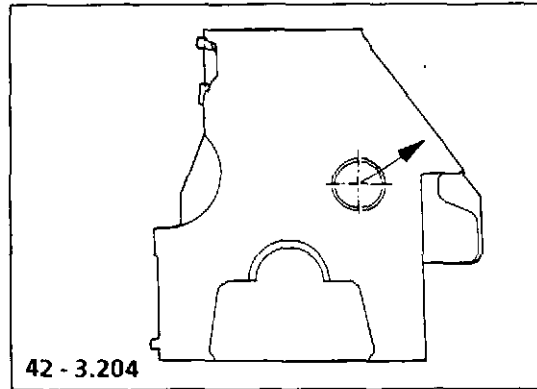
Repair of components

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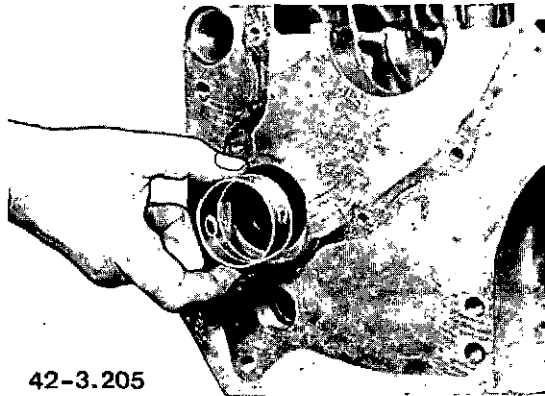
14. Schematic: Installation dimensions of bearing bushes.

	A	B
2 Zyl.	2,0 mm	0,3 mm
		117,1 mm
3 Zyl.	2,0 mm	0,3 mm
	118,9 mm	117,1 mm
4 Zyl.	2,0 mm	0,3 mm
	118,9 mm	117,1 mm
		228,1 mm



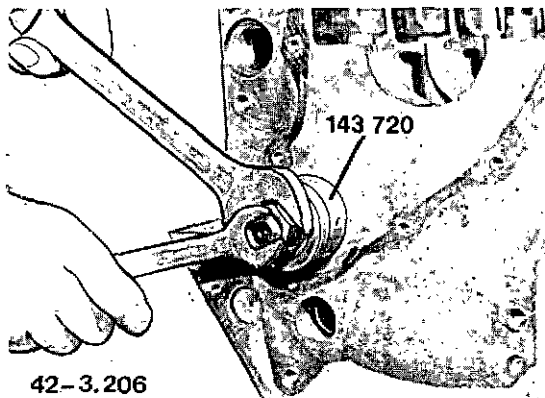
15. Schematic: Direction of installation of joint in the bearing bush.

3



16. Position new bearing bush.

Note:
Lube oil bores must be lined up.

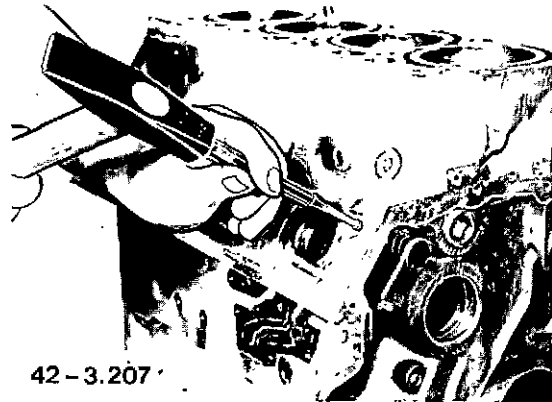


17. Install bearing bush.

Werkstatthandbuch B/FL 1011/T

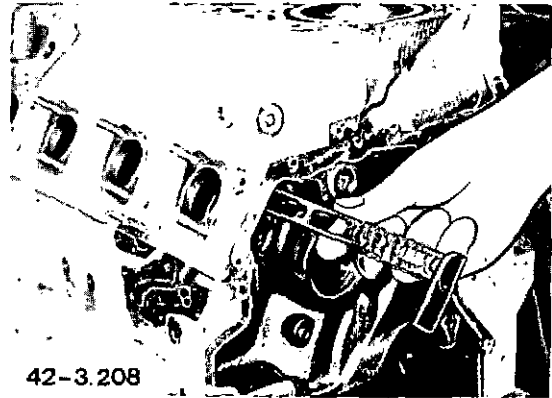
Control rod and guide sleeves.

18. Drive out cylindrical pin.



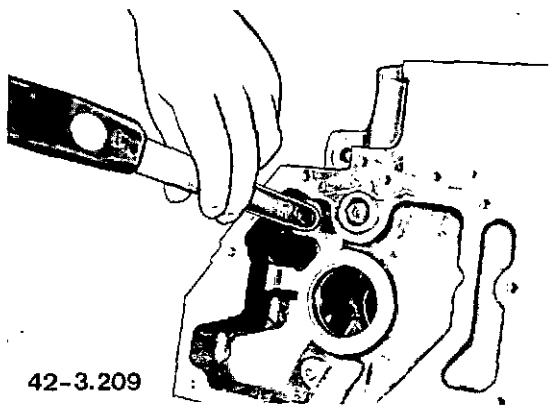
42-3.207

19. Remove control rod together with spring.



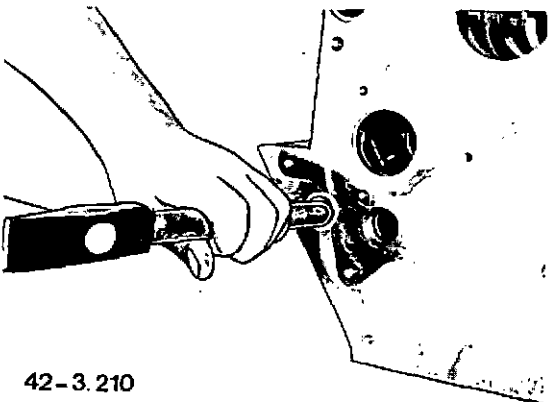
42-3.208

20. Drive out guide sleeve at front end.

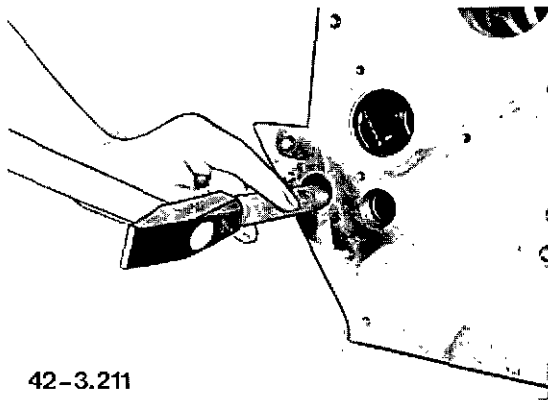


42-3.209

21. Drive out cover.



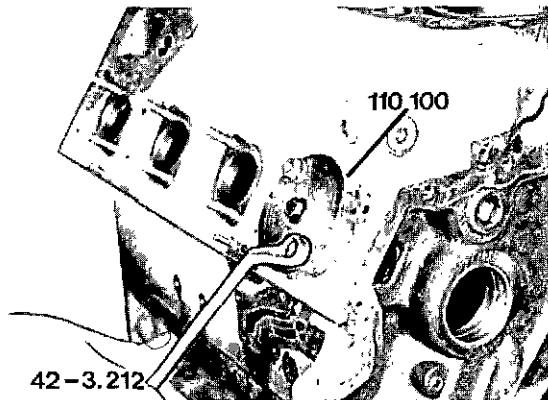
42-3.210



42-3.211



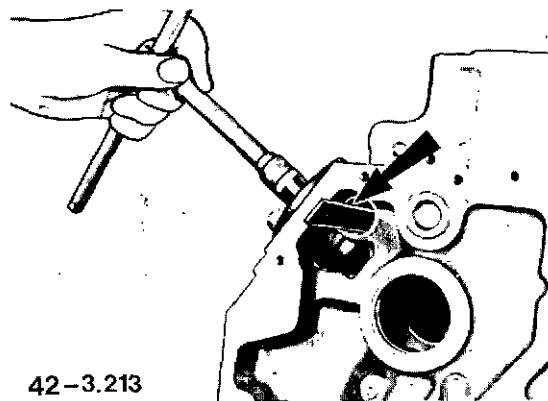
22. Drive out guide sleeve at flywheel end.



42-3.212



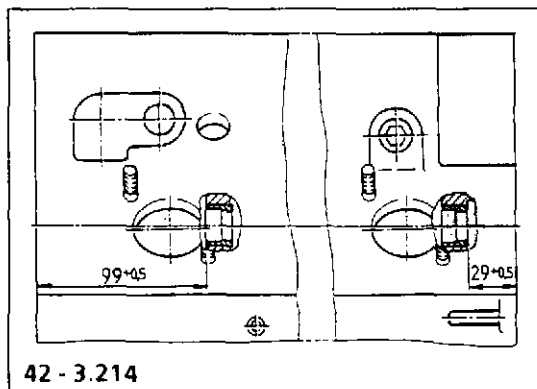
23. Position assembly tool and screw on.



42-3.213



24. Insert guide bar and tighten.

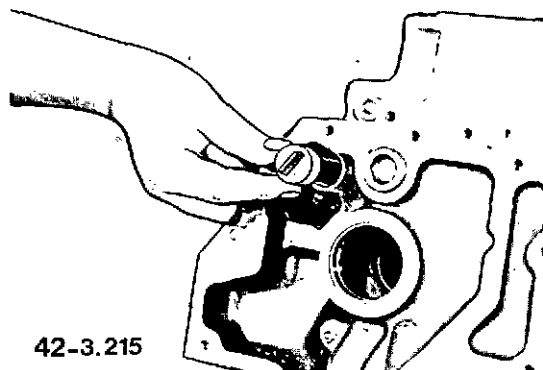


42 - 3.214



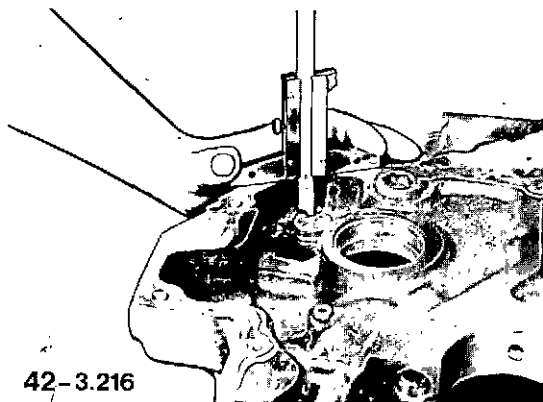
25. Installation schematic: Guide sleeves.

26. Slide guide sleeve over guide bar and drive in, using self-made assembly tube.



42-3.215

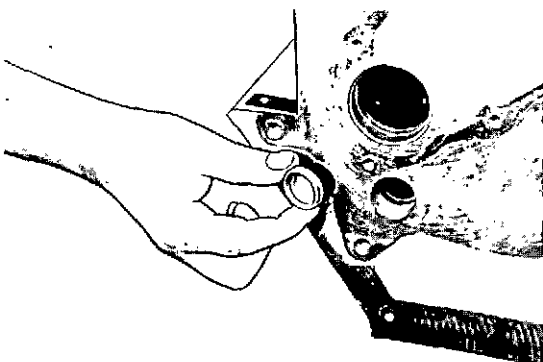
27. Measure distance of guide bar. See schematic.



42-3.216

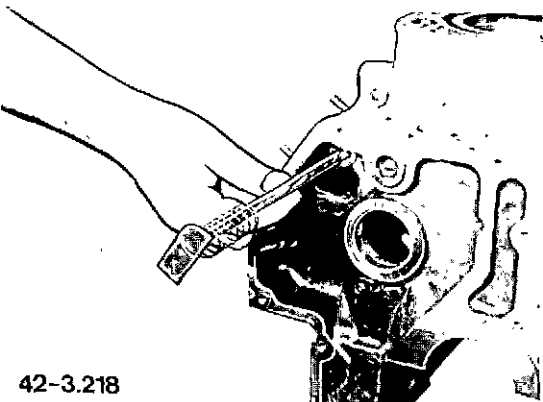
Note:
Installation of guide sleeve at flywheel end: see points 23-27.

28. Apply locking compound DW 71 to new cover and drive in flush.



42-3.217

29. Insert control rod with starter spring into guide sleeve.



42-3.218

Note:
Check for free movement.

Disassembly and reassembly of complete engine

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Dismantling engine

Commercial tools required:

Torx tools
Hose clip pliers
Spec. two-pin spanner
Bent spanner for starter
Multipower tool STW392
Socket a/flats 32 601MP

Special tools required:

Engine assembly stand ... 6067
Angled clamping plate.....
..... 6067/115
Dolly..... 143420
Shim..... 143430
Puller..... 143100
Dolly for camshaft 144130

The repair procedure outlined in this chapter refers to the standard specification, i.e. components for customizing the engine are not shown.

1. Clamp engine in swivel-type engine assembly stand.

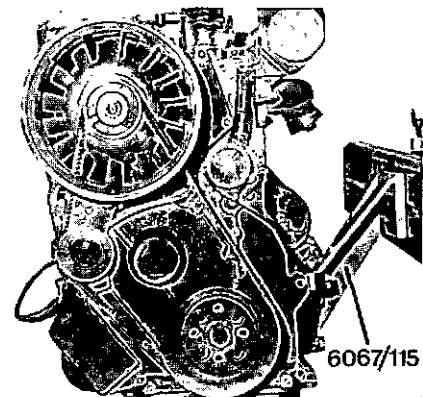
Drain oil / residual oil.

Note:
Starter to be removed before with 2- and 3cylinder engines.



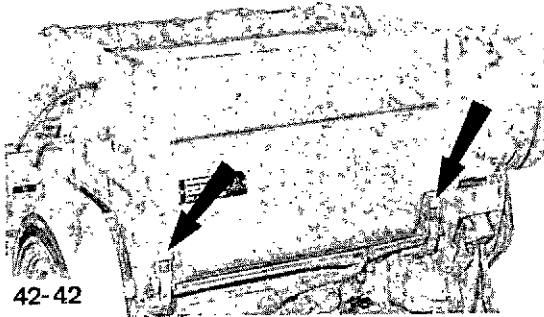
42-4.1

4 / 1

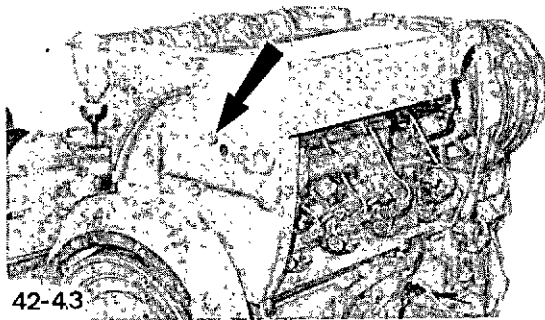


Disassembly and reassembly of complete engine

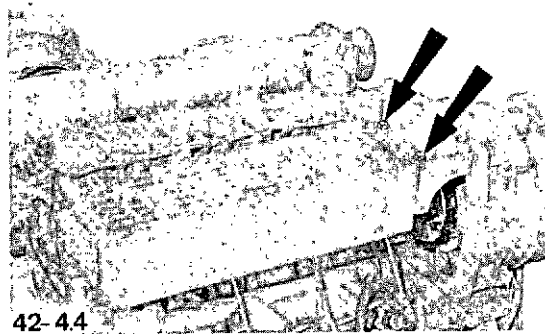
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2. Remove hood.

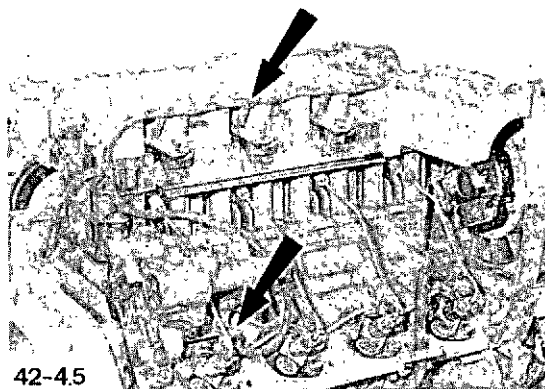


3. Remove stay plate.



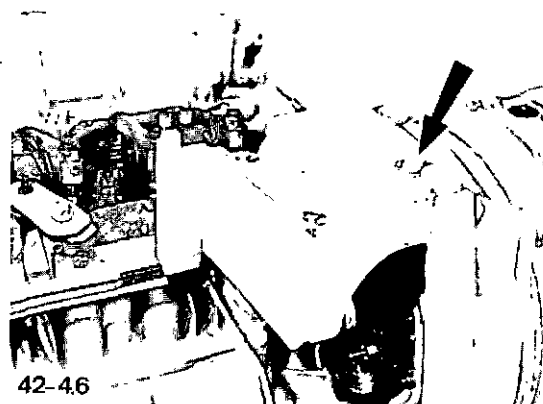
4. Remove oil cooler.

Note:
Catch any escaping oil.

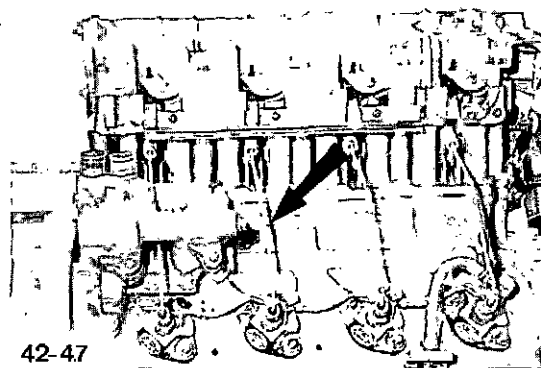


5. Remove leakage fuel pipe.

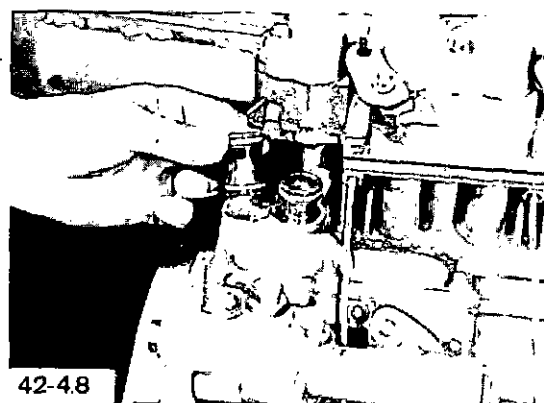
6. Remove cooling air ducting.



7. Remove injection lines.



8. Take adapters out of thermostat housing.



9. Remove thermostat housing.

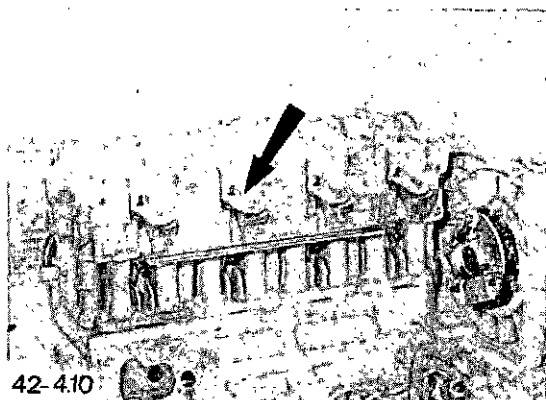


Note:
Catch any escaping oil.

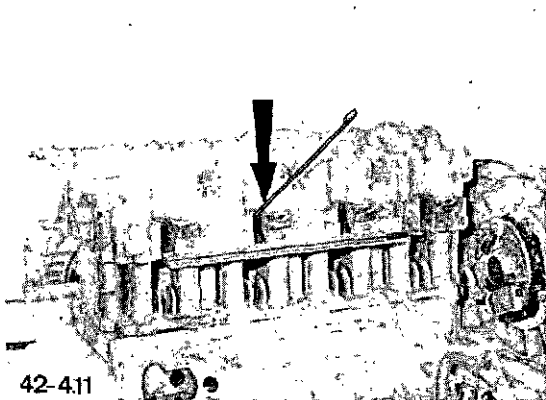


Disassembly and reassembly of complete engine

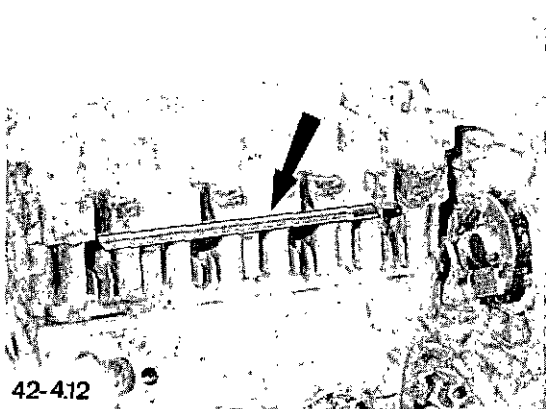
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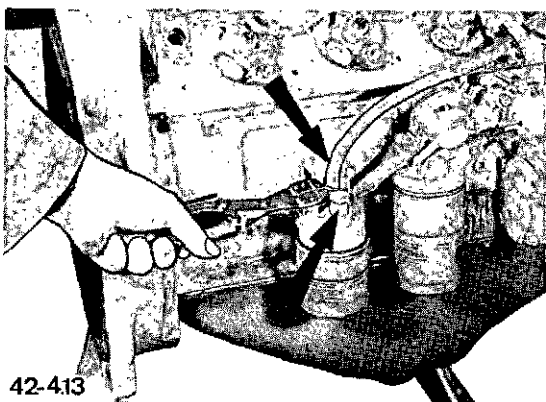
10. Take off clamping pads.
Remove injectors.



11. Remove sealing ring with
auxiliary tool.

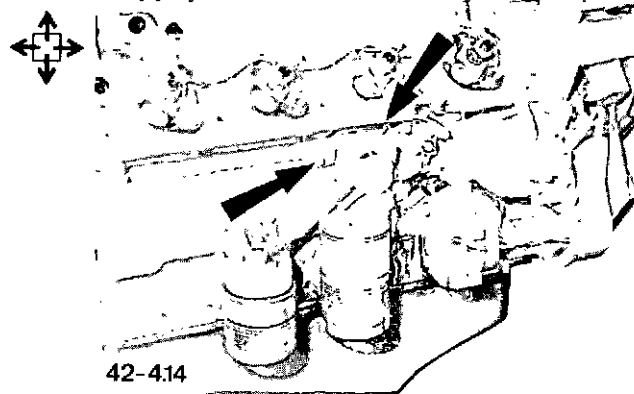


12. Lift off cover strip.

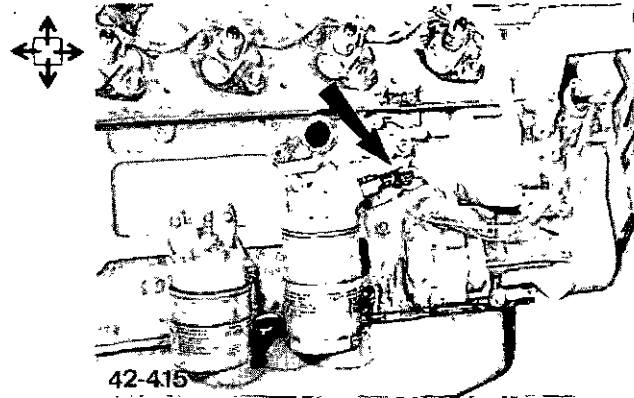


13. Remove fuel lines.

14. Remove fuel feed pump.

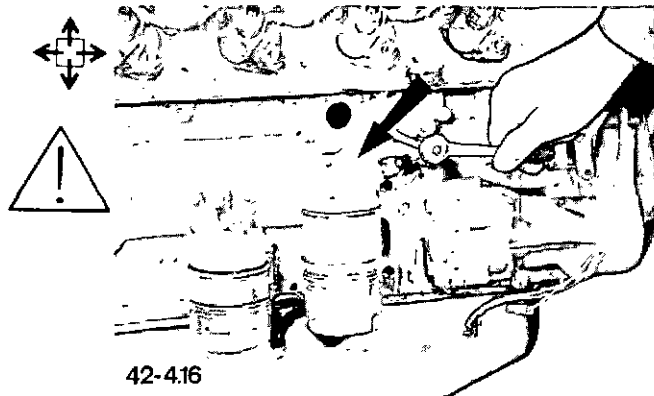


15. Pull off cable plug connection.



16. Remove oil filter housing together with oil filter.

Note:
Catch any escaping oil.



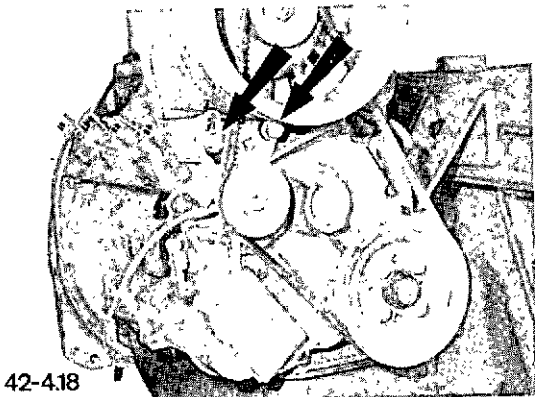
17. Remove fuel filter housing together with fuel filter.

Note:
Catch any escaping fuel.

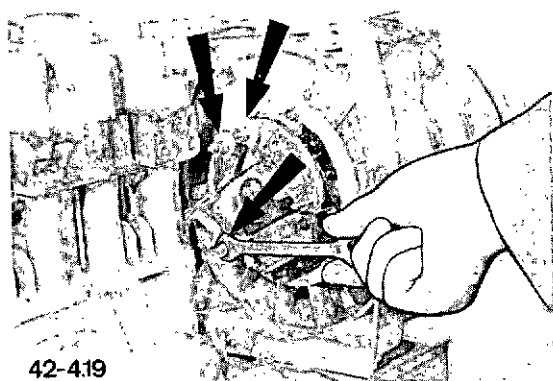


Disassembly and reassembly of complete engine

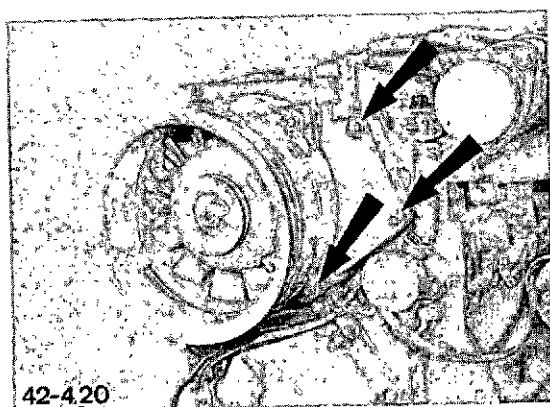
Werkstatthandbuch B/FL 1011/T



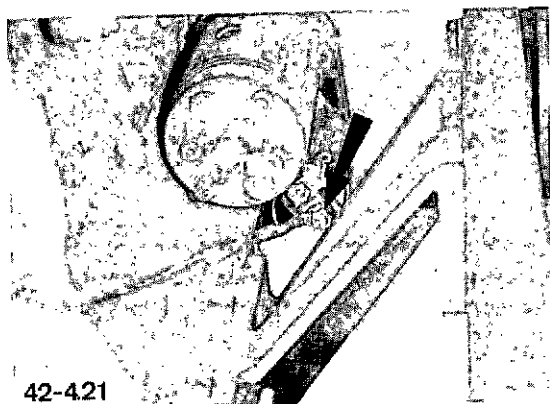
18. Remove idler pulley. Take off V-belt.



19. Mark cables and remove.

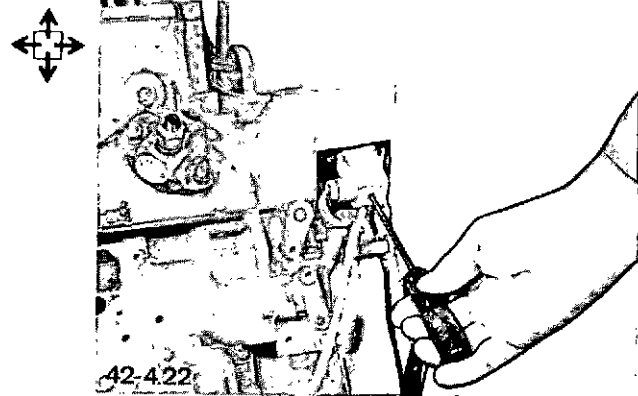


20. Remove blower together with alternator.

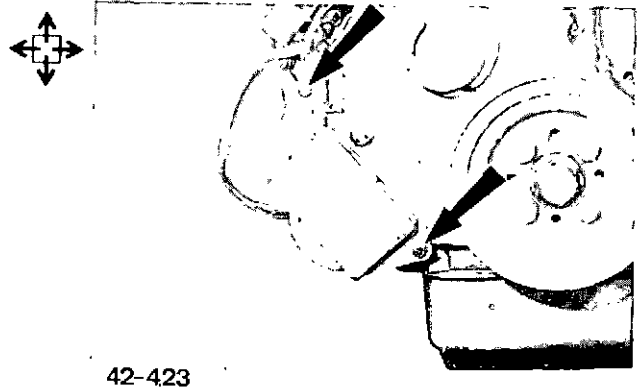


21. Remove cables from starter.

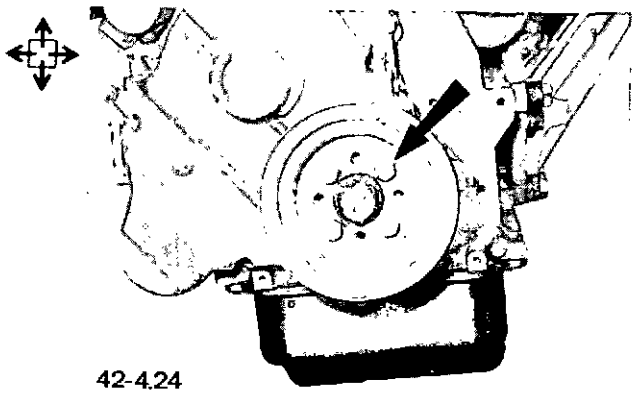
22. Remove cable plug connection.



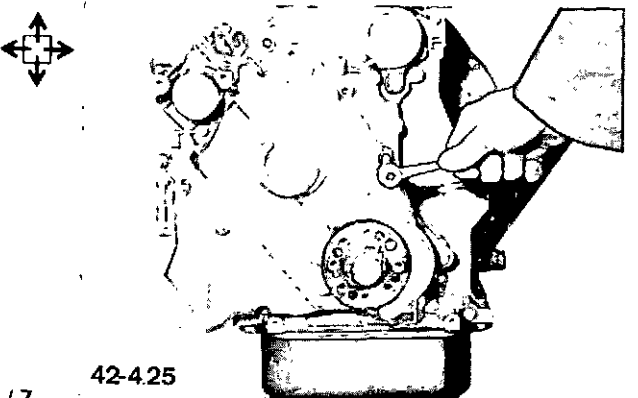
23. Take off cable terminal box.
Remove wiring harness.

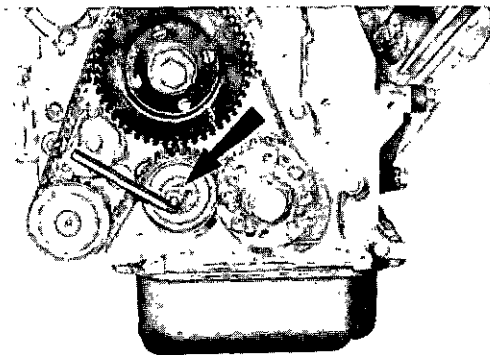


24. Remove V-belt pulley.



25. Removed toothed belt guard.

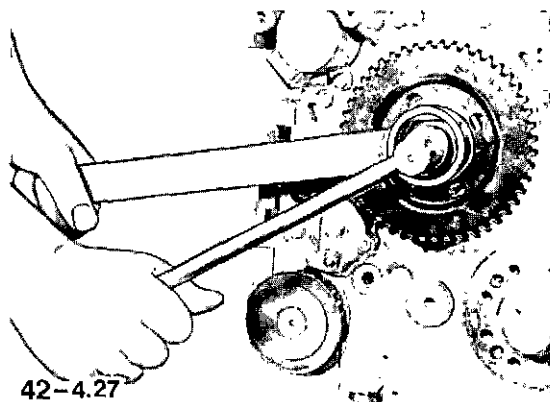




42-4.26



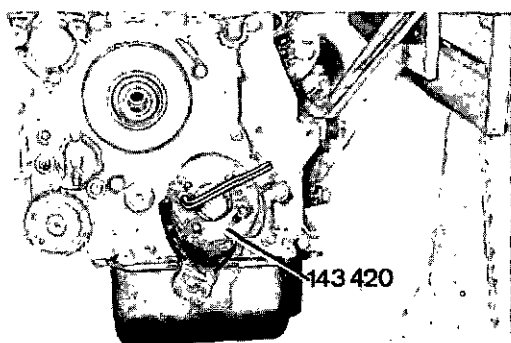
26. Remove idler pulley. Take off toothed belt.



42-4.27



27. Remove camshaft gear!



42-4.28

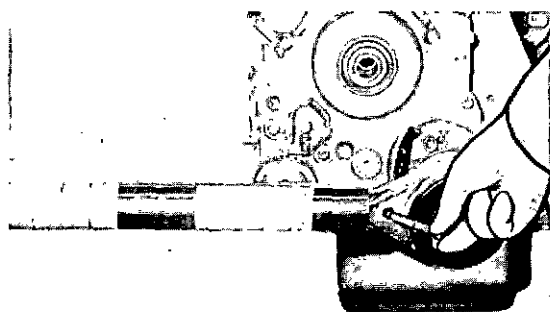


28. Fit dolly for crankshaft gear.



Note:

In the case of new version, fit dolly with shim No. 143430.



42-4.29

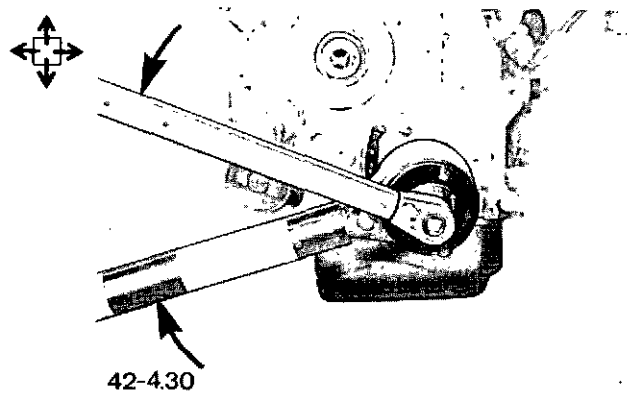


29. Fit multipower tool and screw on.



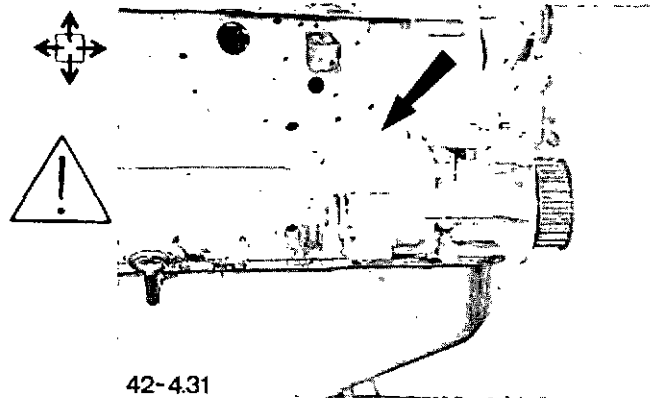
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30. Retain multipower tool and loosen central screw union. Remove crankshaft gear and connecting flange.

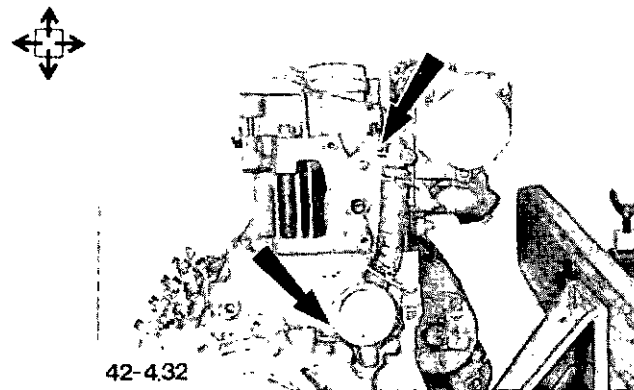


31. Remove lube oil pump.

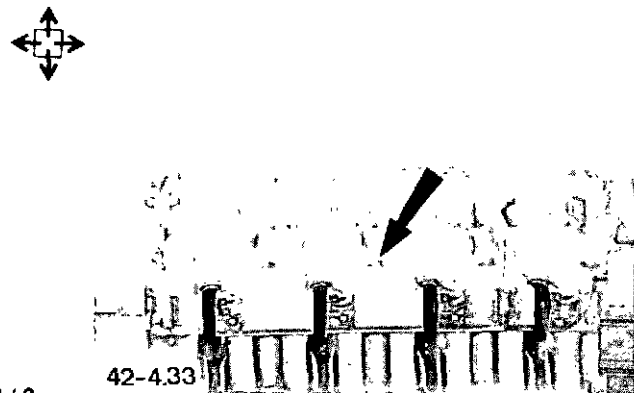
Note:
Catch any escaping oil.



32. Remove complete crankcase breather.

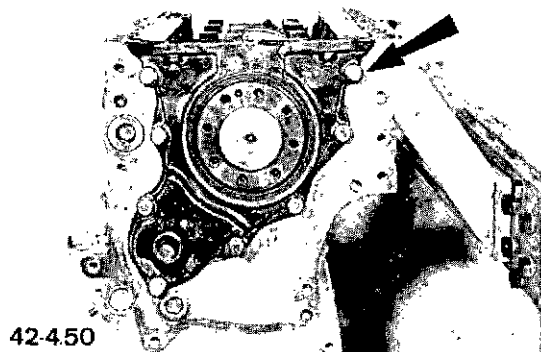


33. Lift off valve cover.



Disassembly and reassembly of complete engine

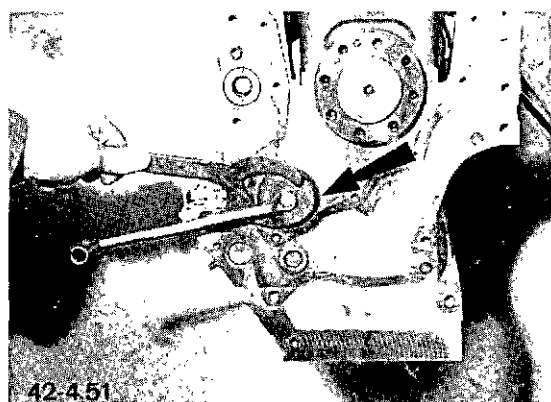
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42-4.50



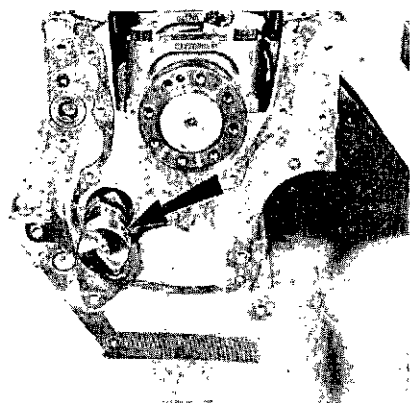
50. Remove rear cover.



42-4.51



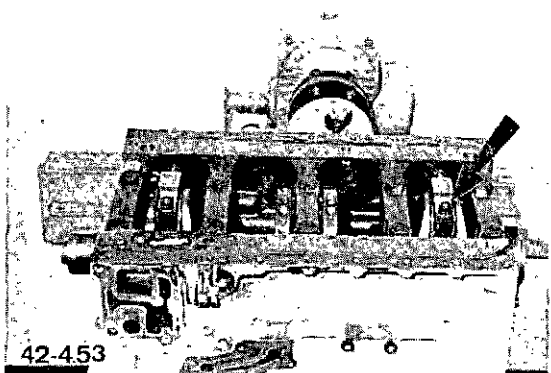
51. Take off thrust washers for camshaft.



42-4.52



52. Remove camshaft.



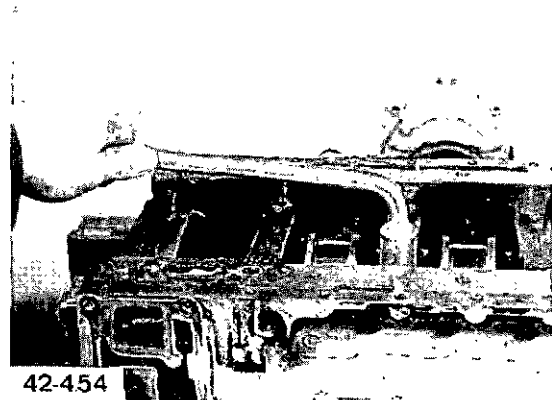
42-4.53



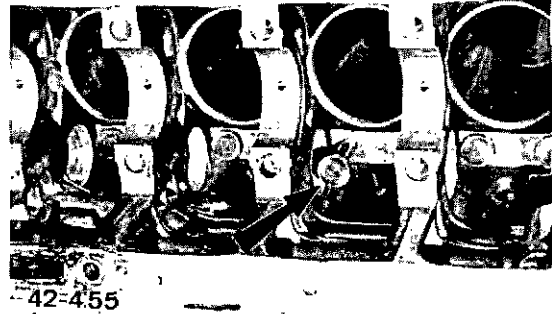
53. Remove piston complete with connecting rod.

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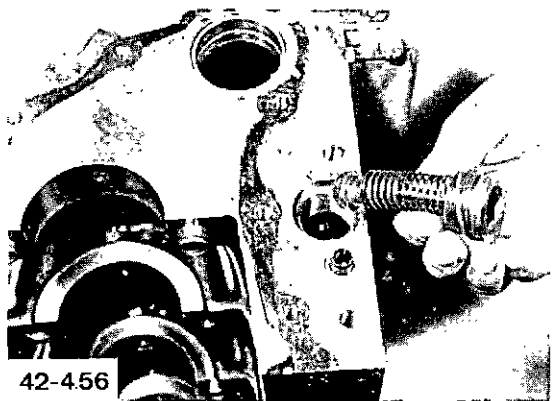
54. Remove main bearing caps.
Lift out crankshaft.



55. Take out tappets.

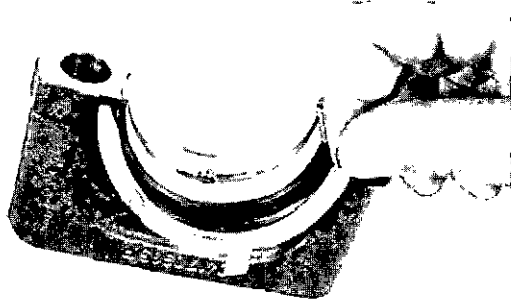


56. Remove oil pressure control
valve.



Disassembly and reassembly of complete engine

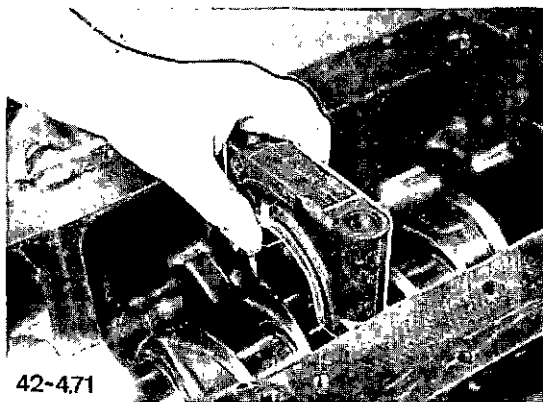
Werkstatthandbuch B/FL 1011/T



42-470



14. Stick half thrust rings with lug to thrust bearing cap using some grease.



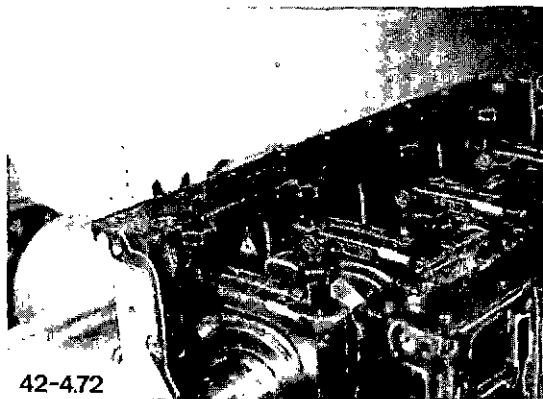
42-471



15. Mount thrust bearing cap.

Note:

Bearing cap No. 1 at flywheel end.
Chamfer must be directed away from flywheel side.

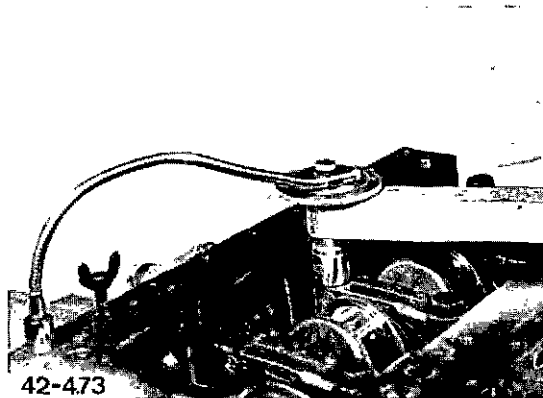


42-472



16. Mount main bearing caps, paying attention to the numbering.

4



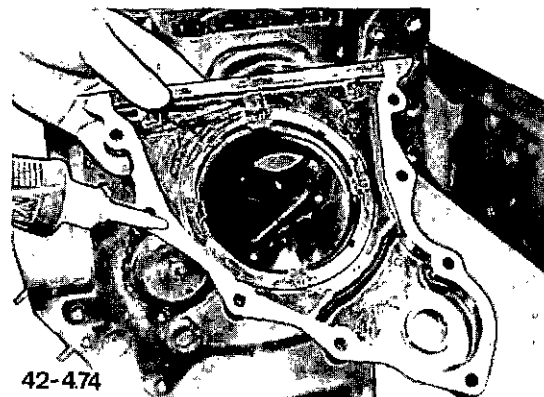
42-473



17. Tighten main bearing bolts in accordance with specifications.

Rear cover

18. Apply sealing compound Deutz DW 67 to rear cover.

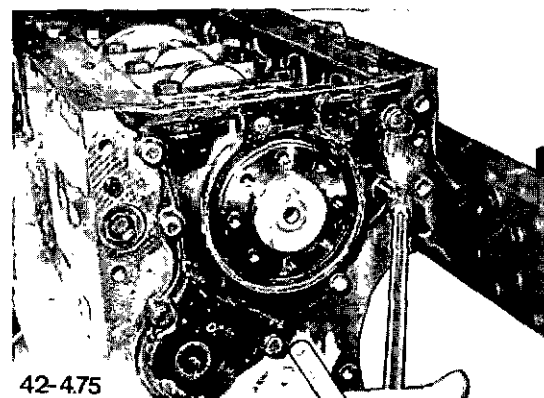


18.1. Fit cover complete with shaft seal.



Note:

Align cover relative to oil pan sealing surface.



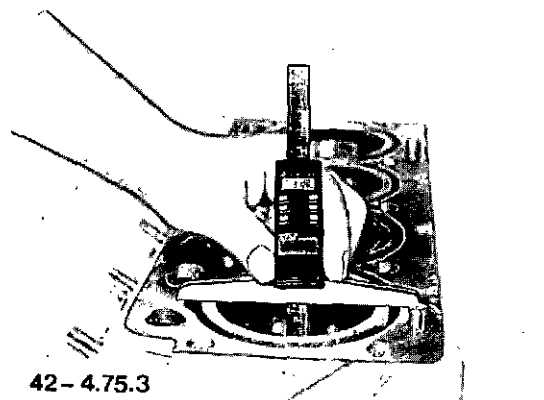
Gauge distance between top edge of crankpin TDC and cylinder head gasket seating surface.



19. Turn adjusting pin as far as stop. Turn crankshaft as far as stop.

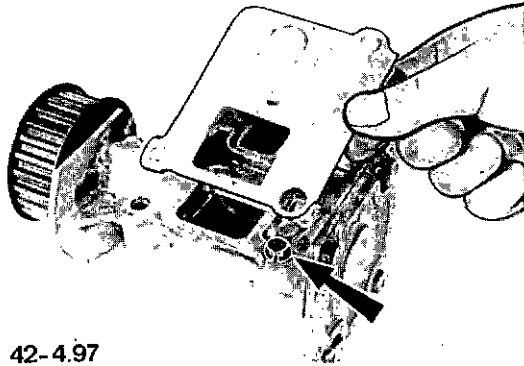


19.1 Gauge on every cylinder distance between top edge of crankpin TDC and cylinder head gasket seating surface.



Disassembly and reassembly of complete engine

Werkstatthandbuch B/FL 1011/T



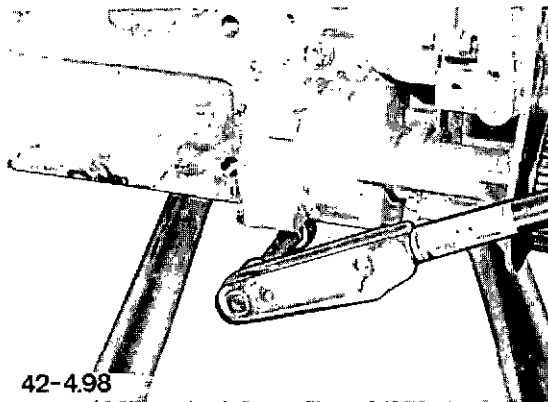
42-4.97



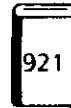
Lube oil pump

46. Position gasket and mount oil pump.

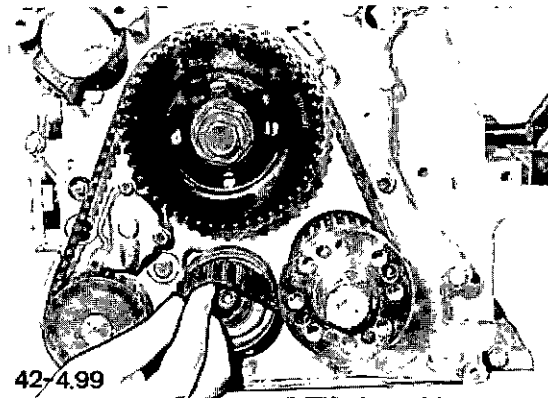
Note:
Watch dowel sleeves.



42-4.98



47. Secure lube oil pump in accordance with specifications.



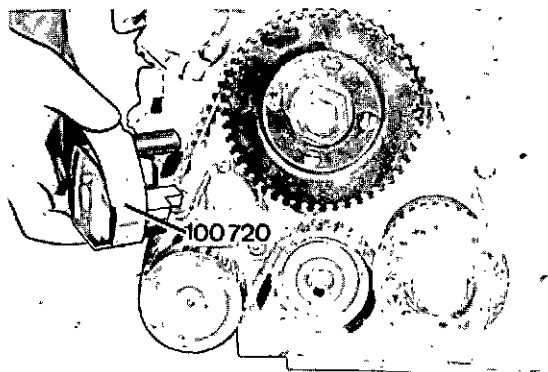
42-4.99



Toothed belt adjustment

48. Position toothed belt so as to ensure a uniform distance from front cover of 8 - 9 mm.

Note:
Hold crankshaft in stop position while adjusting toothed belt.



42-4.100

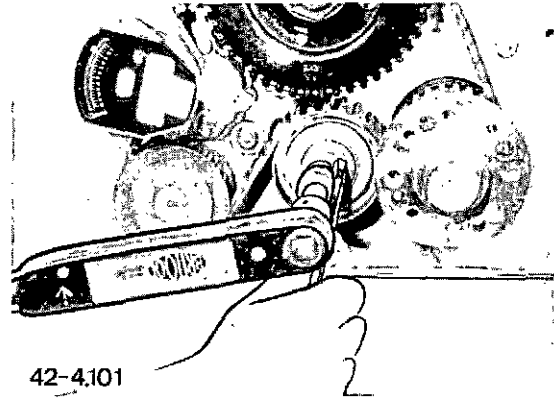


49. Fit device for measuring toothed belt tension.

Note:
Measuring device may only have contact with toothed belt.

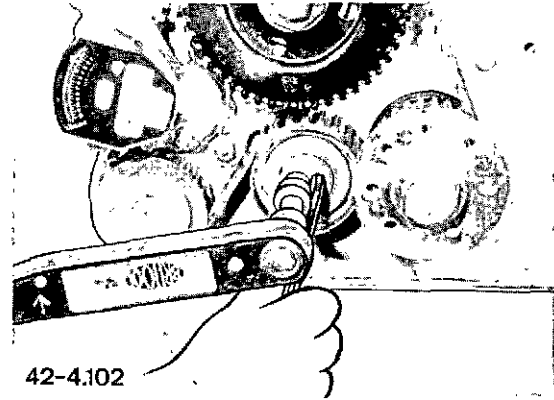
Werkstatthandbuch B/FL 1011/T

50. Preload toothed belt. Turn idler pulley in anti-clockwise direction to obtain a scale reading of 3.0 - 3.5.



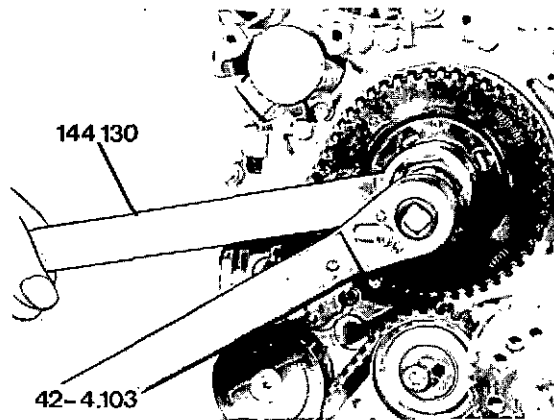
42-4.101

51. Tighten idler pulley bolt with 45 Nm.



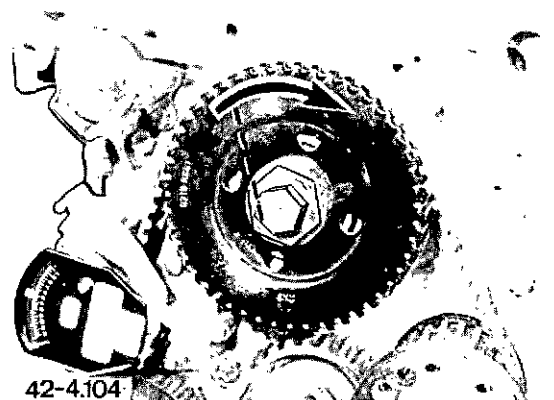
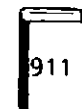
42-4.102

52. Retain centering washer. Tighten central bolt with 30 Nm preload.



42-4.103

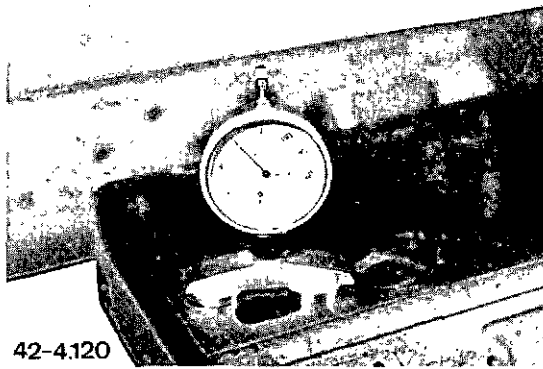
53. Mark camshaft bolt and centering washer and tighten in accordance with specifications.



42-4.104

Cylinder head

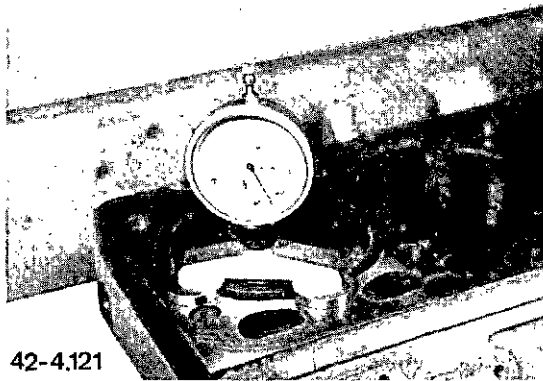
68. Determine cylinder head gasket.



42-4.120



68.1 Place spacer plate on sealing surface of crankcase with integrated liners and set dial gauge to „0“.

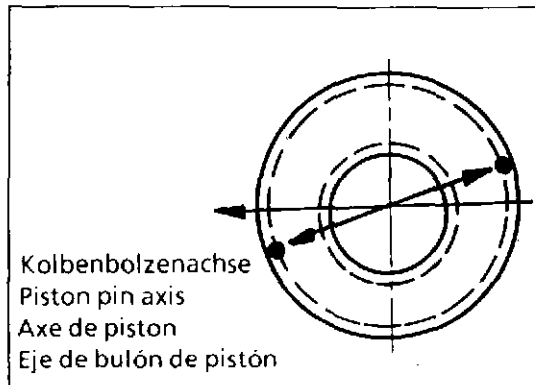


42-4.121



68.2 Position dial gauge on piston at gauge points and determine max. piston projection.

Note:
All pistons must be gauged.



Kolbenbolzenachse
Piston pin axis
Axe de piston
Eje de bulón de pistón



68.3 Watch gauge points.

Werkstatthandbuch B/FL 1011/T

68.4 Compare max. value with table and determine appropriate cylinder head gasket.



Piston projection	Marking of cylinder head gasket
0.590 - 0.69 mm	1 notch
0.691 - 0.76 mm	2 notches
0.761 - 0.83 mm	3 notches

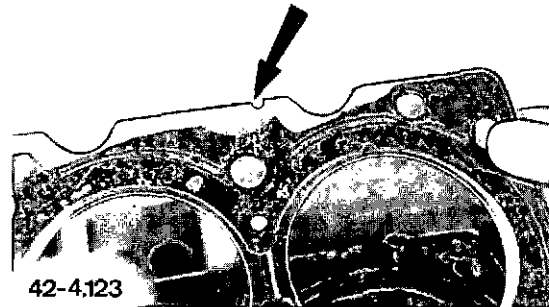
69. Place on cylinder head gasket.



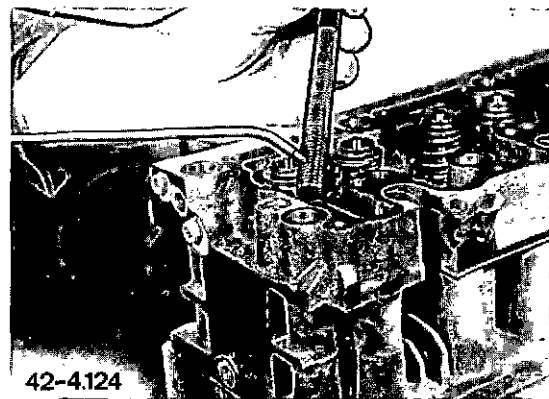
Note:
Sealing surfaces of cylinder head gasket must be free of oil.



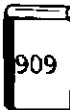
Watch dowel sleeves.



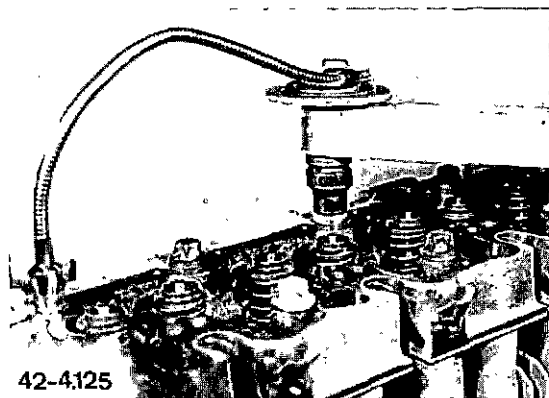
70. Fit cylinder head, oil cylinder head bolts slightly



71. Tighten cylinder head bolts in accordance with specifications.

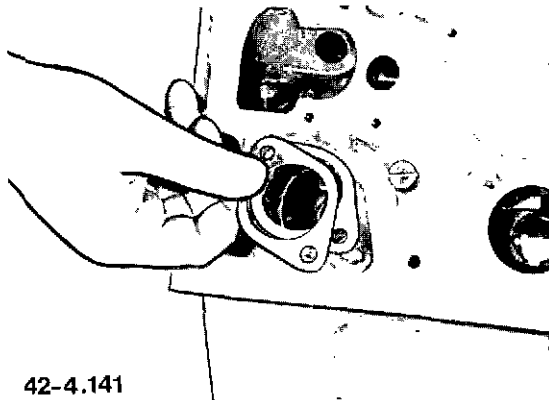


Note:
Watch tightening order (see page 1/37).



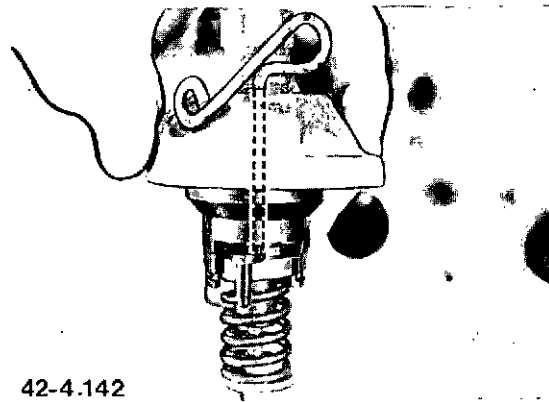
Disassembly and reassembly of complete engine

Werkstatthandbuch B/FL 1011/T



42-4.141

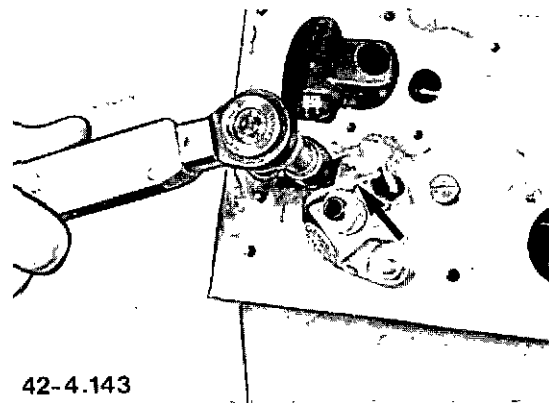
90. Place on appropriate number of shims.



42-4.142

91. Note:

Before mounting injection pump, make sure that centering pin is engaged in control lever.

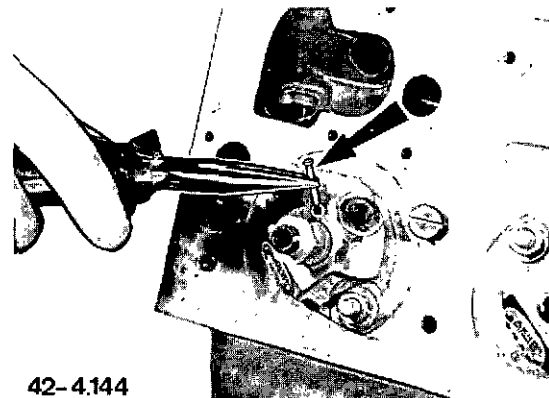


42-4.143

92. Fit injection pump in place. Then press pump down onto its seat, taking care that it is accurately centered. Tighten nuts in accordance with specifications.

Note:

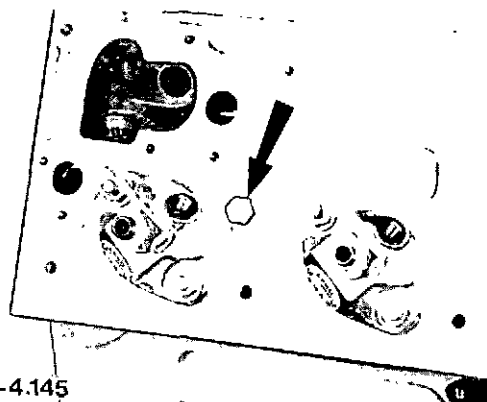
Remove centering pin.



42-4.144

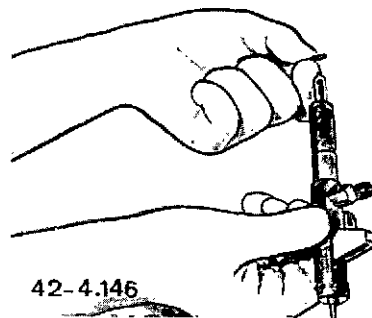
93. Close bore with plug.

94. Remove locating pin for control rod. Cover up bore with new Cu sealing ring.



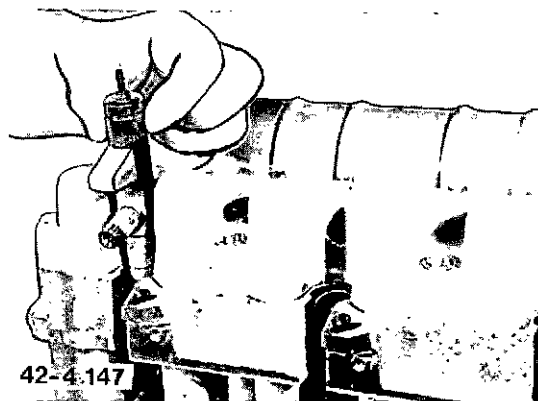
42-4.145

95. Slide sealing ring over injector using some grease.



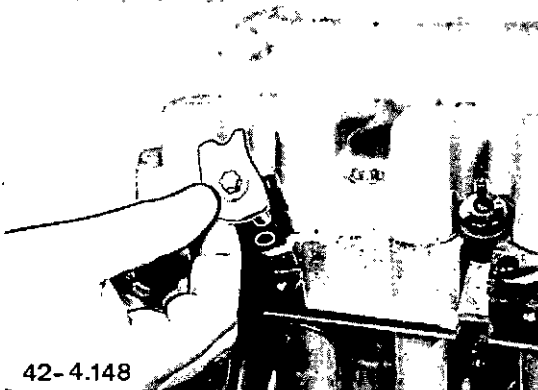
42-4.146

96. Insert injector.

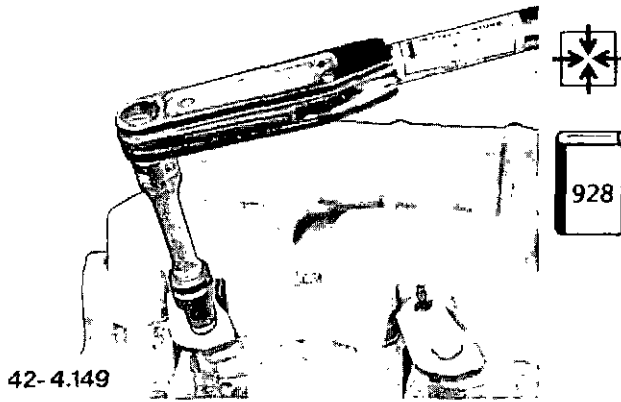


42-4.147

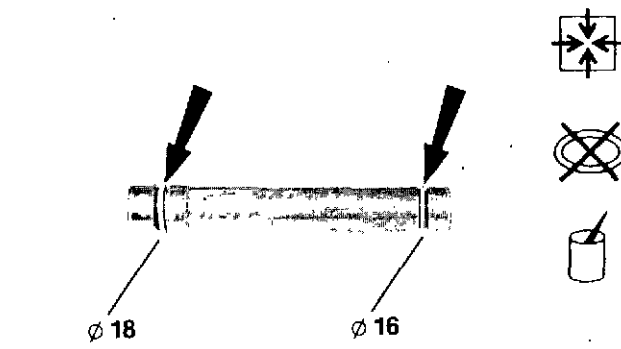
97. Fit clamping pad.



42-4.148

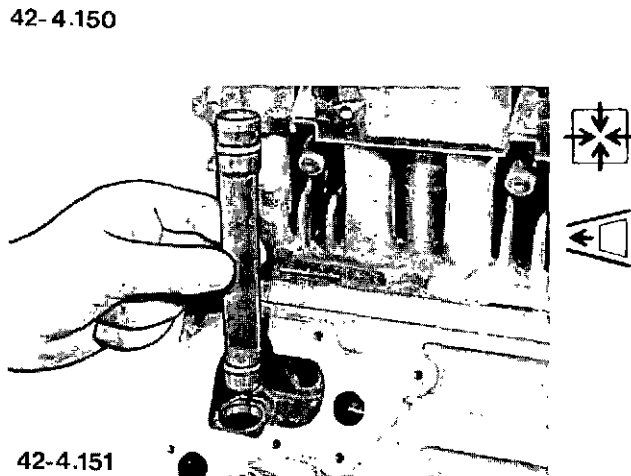


98. Tighten bolts in accordance with specifications.

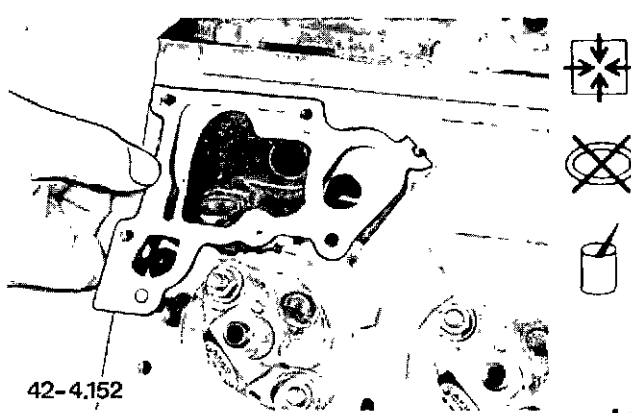


Connecting pipe

99. Fit O-seals.



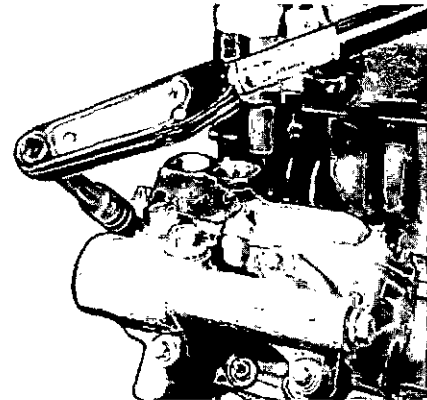
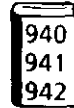
100. Press in connecting pipe as far as it will go.



101. Stick gasket in position using grease.

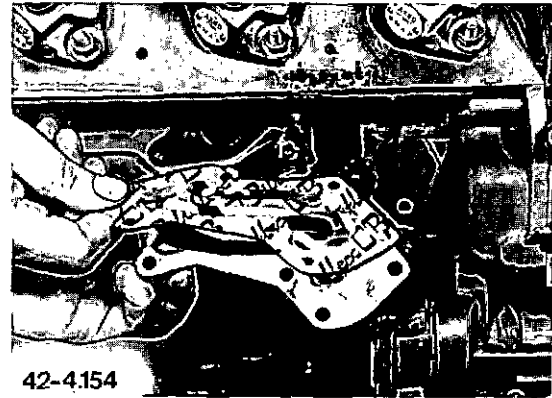
Werkstatthandbuch B/FL 1011/T

102. Fit thermostat housing.
Tighten bolts in accordance with specifications.



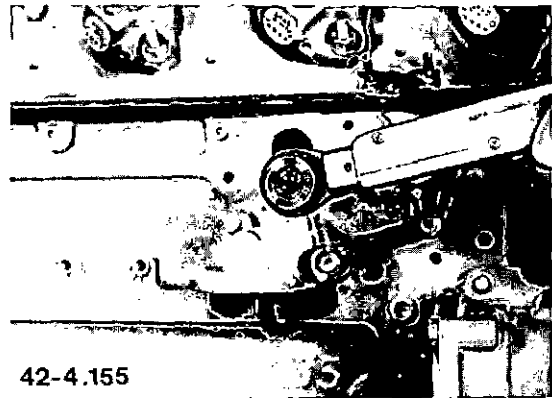
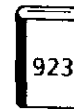
42-4.153

103. Stick gasket in position
using grease.



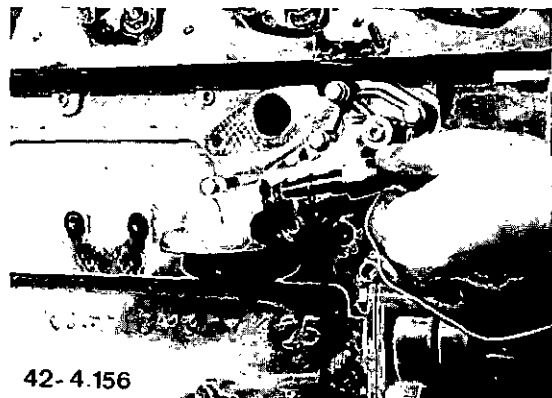
42-4.154

104. Fit oil filter bracket. Tighten
bolts in accordance with specifi-
cations.

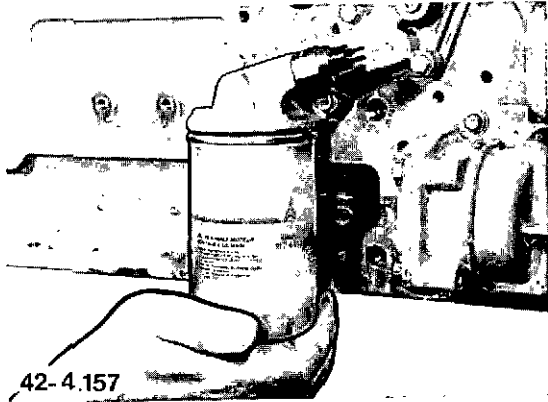


42-4.155

105. Fit temperature pick-up with
new Cu seal.



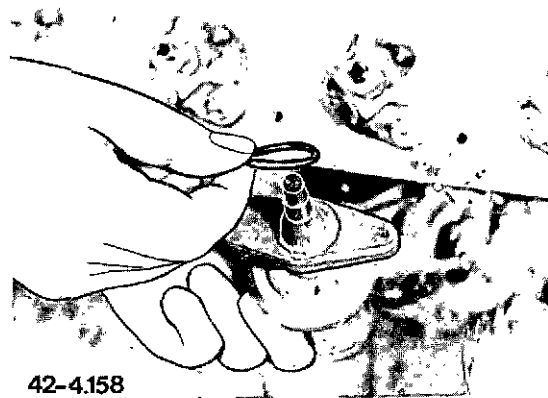
42-4.156



42-4.157



106. Slightly oil oil filter gasket. Lock oil filter cartridge finger-tight.

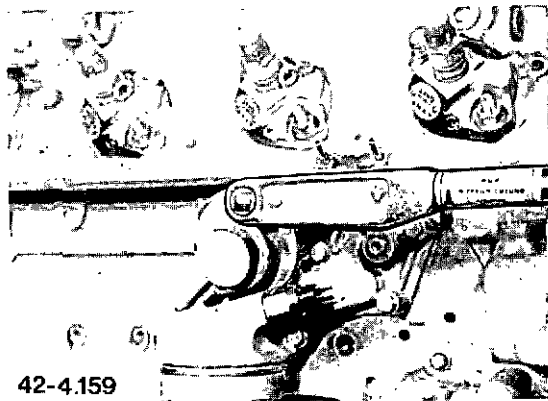


42-4.158



Fuel feed pump

107. Fit new O-seal.

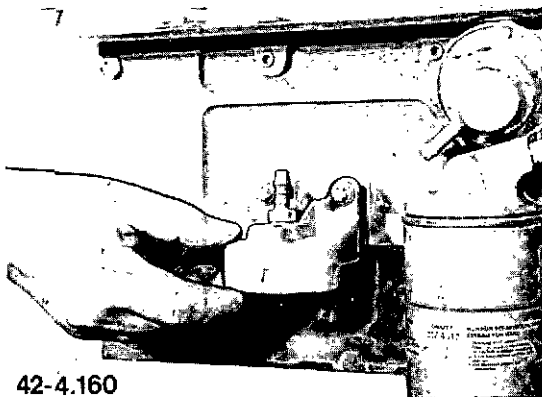


42-4.159



108. Mount fuel feed pump. Tighten bolts evenly in accordance with specifications.

Note:
Set lift cam to BDC.



42-4.160



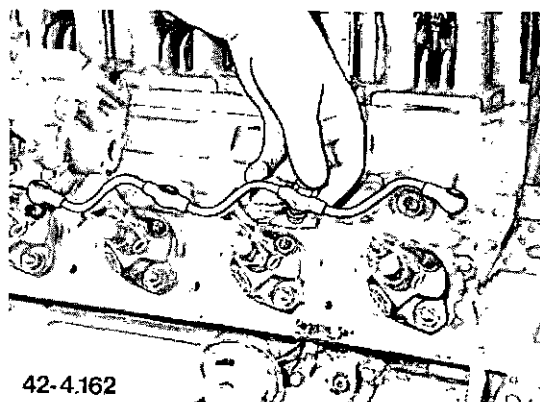
109. Fit fuel filter bracket

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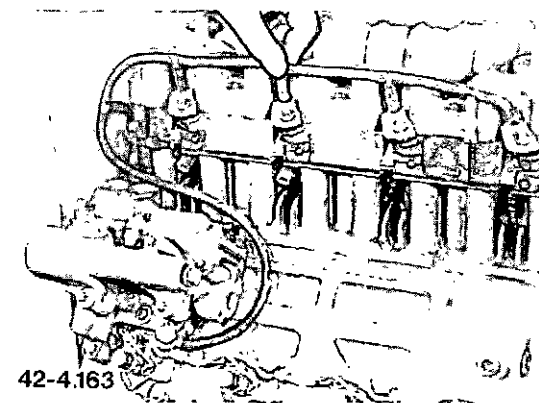
110. Slightly oil fuel filter gasket.
Lock filter cartridge fingertight.



111. Fit fuel line with new Cu
sealing rings.



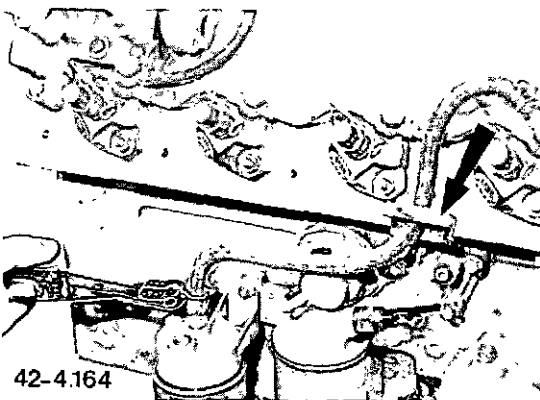
112. Fit leakage fuel line.



113. Fit fuel hose to injection
pump and fuel filter. Press on
profiled rubber.

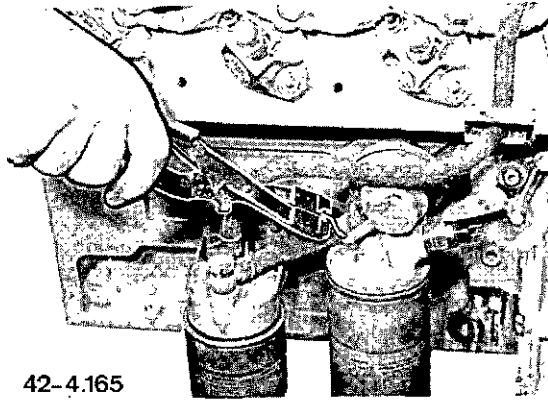


Note:
Use hose clip pliers.



Disassembly and reassembly of complete engine

Werkstatthandbuch B/FL 1011/T

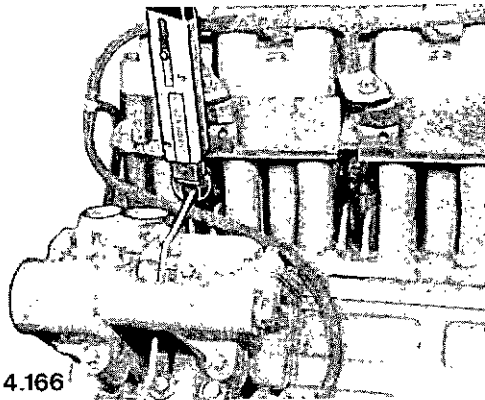


42-4.165



114. Fit fuel hose between fuel filter and fuel pump.

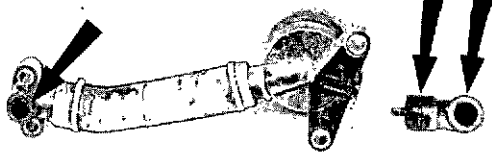
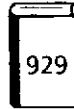
Note:
Use hose clip pliers.



42-4.166



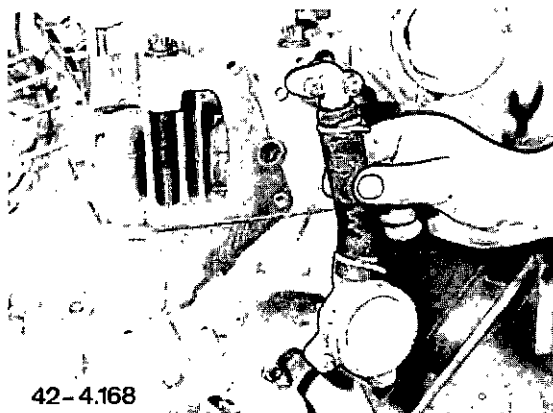
115. Fit injection lines and tighten in accordance with specifications.



42-4.167



116. Fit new O-seals for crankcase breather.

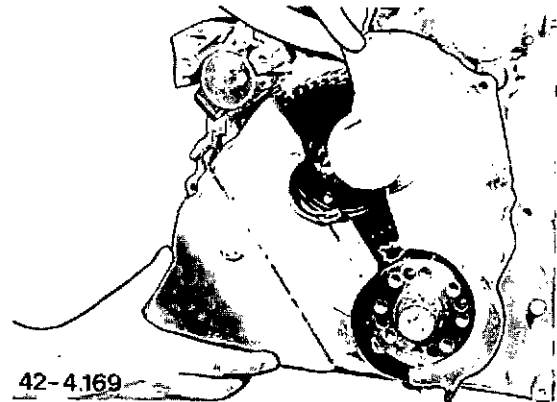


42-4.168



117. Mount crankcase breather.

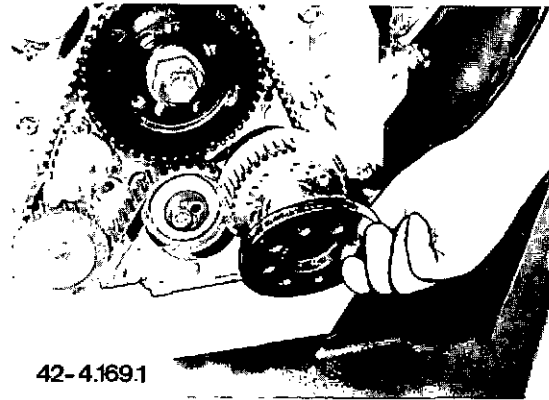
118. Fit toothed belt guard



42-4.169

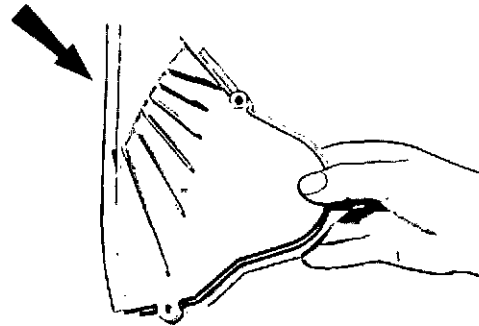
New version

118.1 Position shim with chamfered side facing the engine.



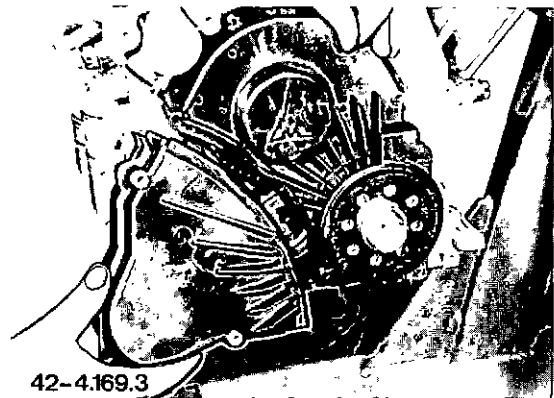
42-4.169.1

118.2 Push in sealing rubber.

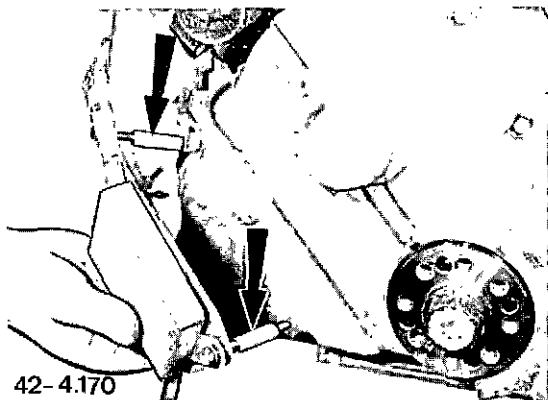


42-4.169.2

118.3 Fit toothed belt guard.



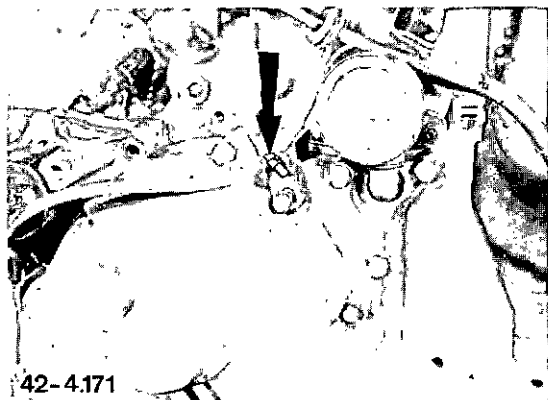
42-4.169.3



42-4.170

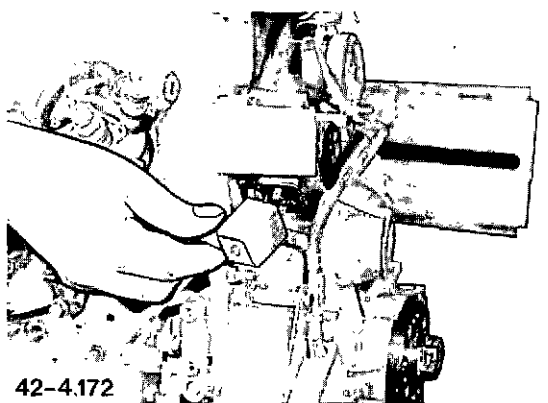
119. Fit cable terminal box and wiring harness with spacer sleeves and special washers.

Note:
On new toothed belt guard version: without spacer sleeves and special washers.



42-4.171

120. Fit securing clip to toothed belt guard.



42-4.172

121. Fit cable plug connection and secure.



42-4.173

122. Fit cable plug connection.

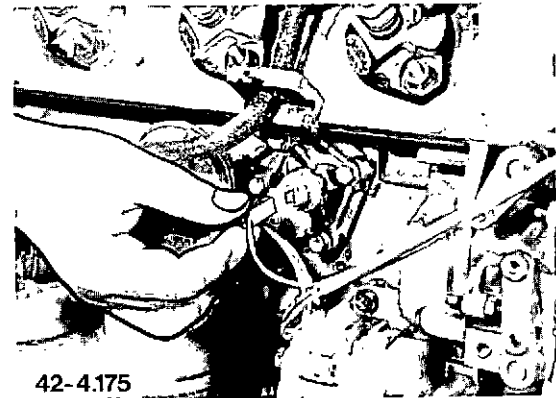
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123. Install oil pressure pickup with new Cu sealing ring.



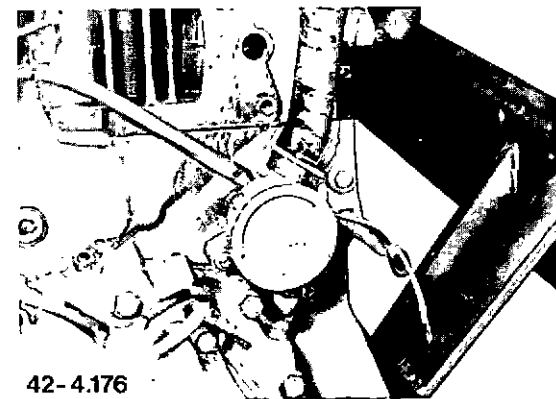
42-4.174

124. Fit cable plug connection.



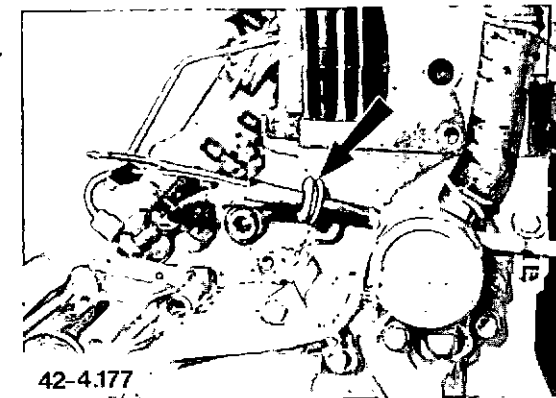
42-4.175

125. Install wiring harness behind crankcase breather.

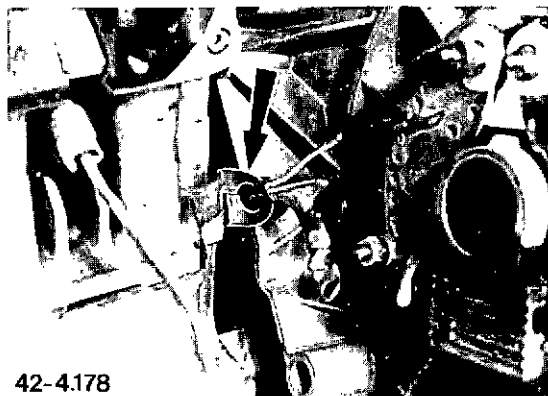


42-4.176

126. Fit rubber grommet to wiring harness.



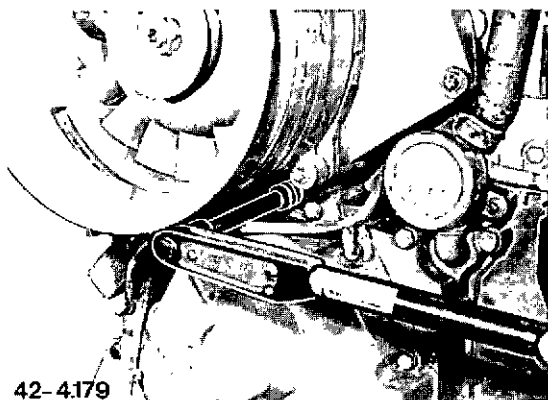
42-4.177



42-4.178



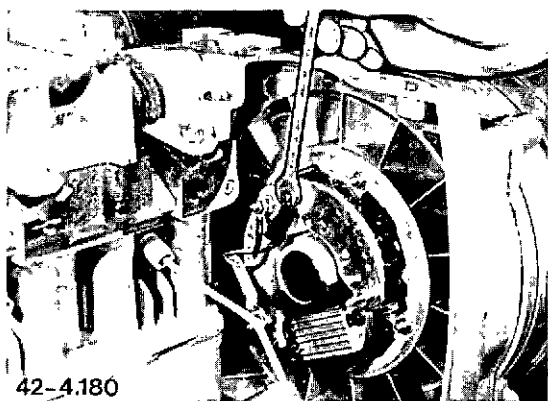
127. Press rubber grommet into blower.



42-4.179



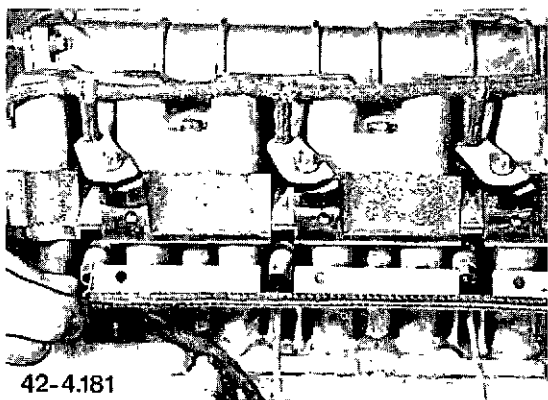
128. Mount blower Tighten bolts in accordance with specifications.



42-4.180



129. Install cables as marked.

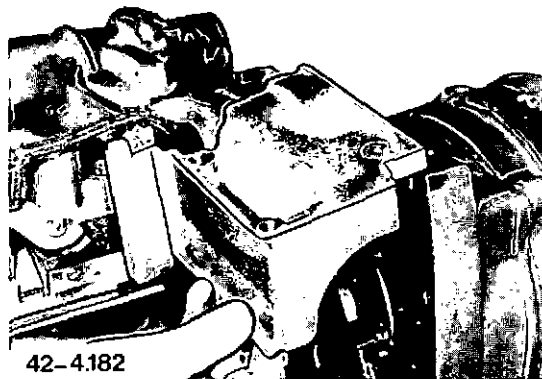


42-4.181



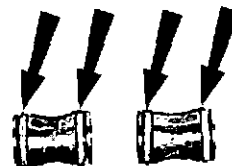
130. Fit cover strip.

131. Fit cooling air ducting.



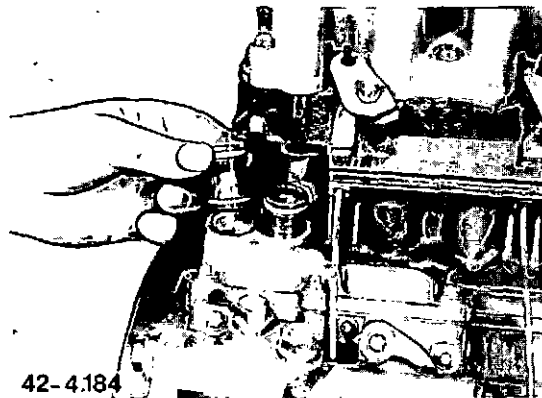
42-4.182

132. Slide new O-seals over adapters.



42-4.183

133. Press adapters into thermostat housing.

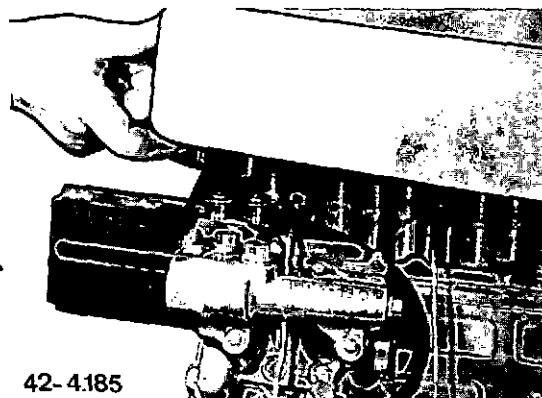


42-4.184

134. Mount oil cooler.



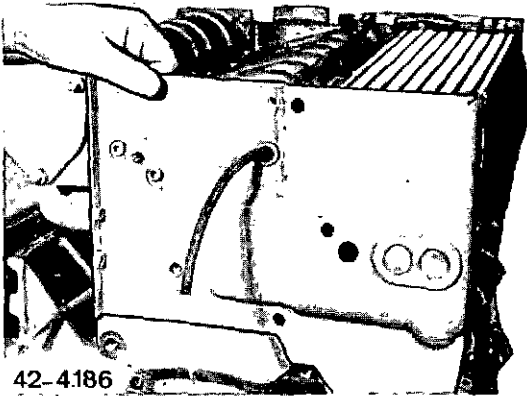
Note:
Do not tighten bolts yet.



42-4.185

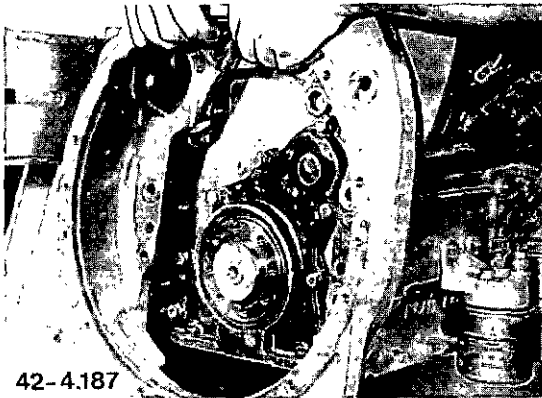
Disassembly and reassembly of complete engine

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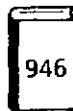
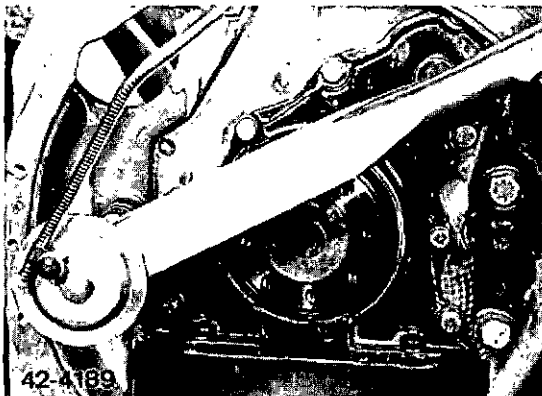
135. Fit stay plate.

Note:
Tighten bolts for oil cooler and stay plate.



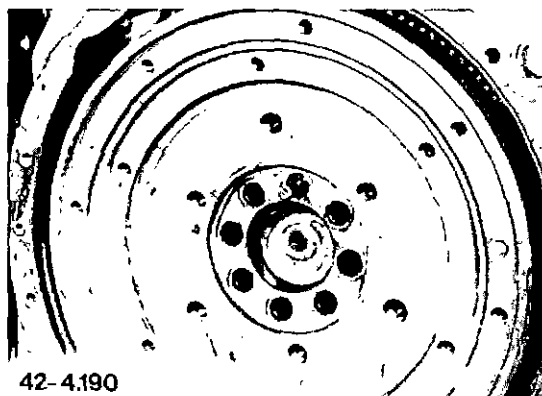
136. Mount adapter housing.

Note:
Make sure that centering bushes are fitted.



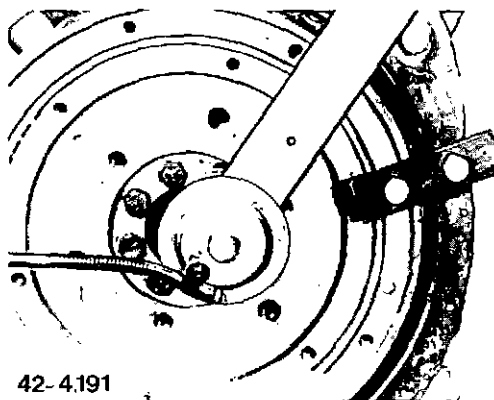
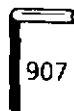
138. Tighten bolts in accordance with specifications.

139. Mount flywheel, using a selfprepared threaded mandrel (sketch). Lock bolts fingertight.



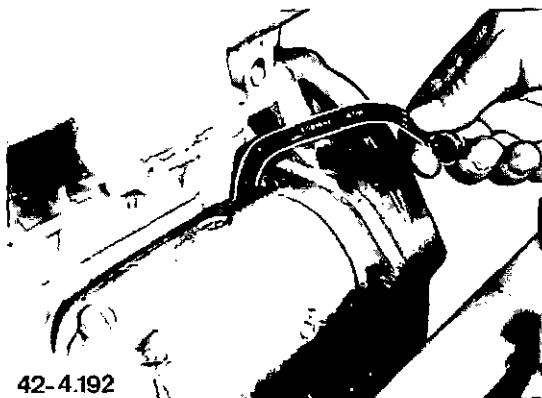
42- 4.190

140. Retain flywheel, using a selfprepared dolly (sketch). Tighten bolts in accordance with specifications.



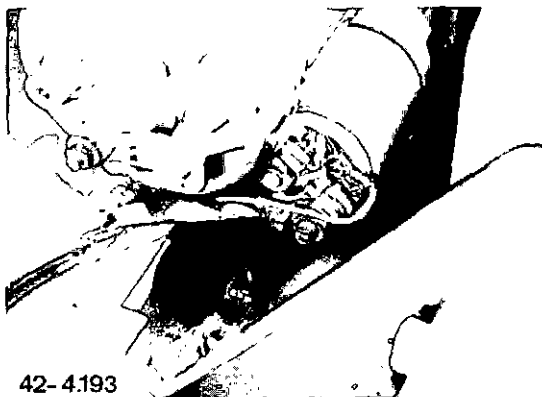
42- 4.191

141. Mount starter.



42- 4.192

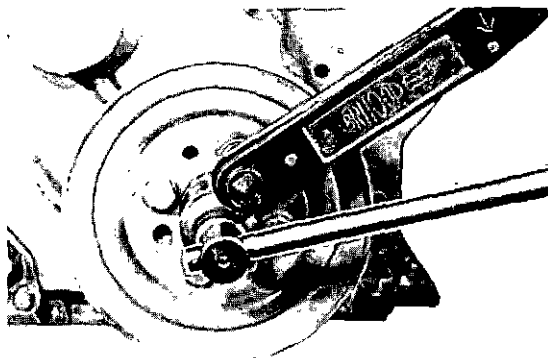
142. Fit cables to starter and fasten clips.



42- 4.193

Disassembly and reassembly of complete engine

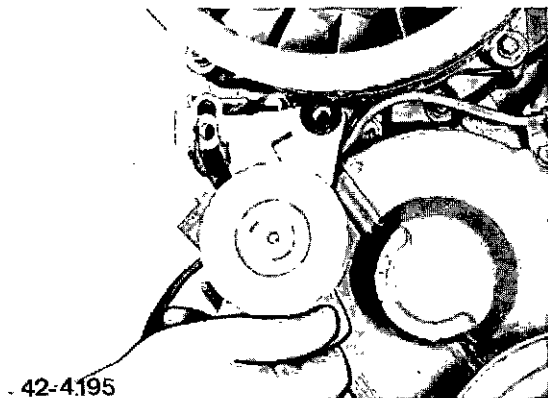
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42-4.194



143. Fit V-belt pulley.
Tighten bolts in accordance with specifications.

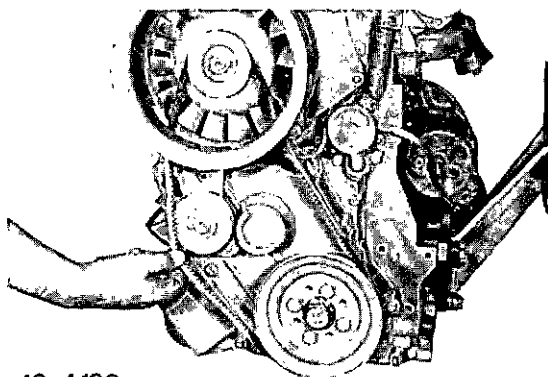


42-4.195



144. Fit V-belt idler pulley.

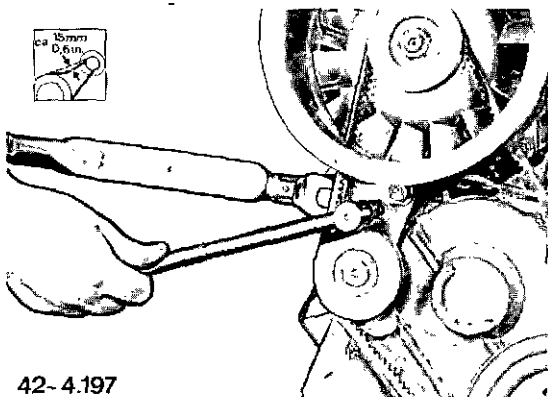
Note:
Start bolts.



42-4.196



145. Place on V-belt.

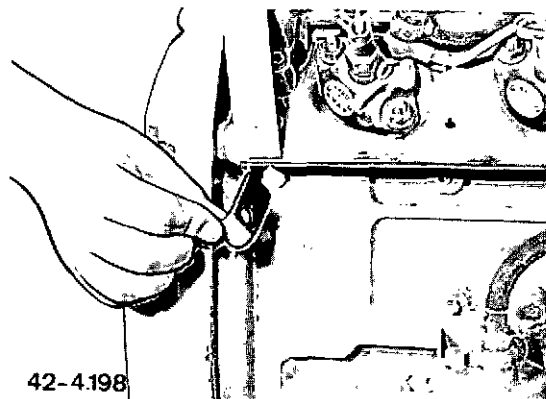


42-4.197

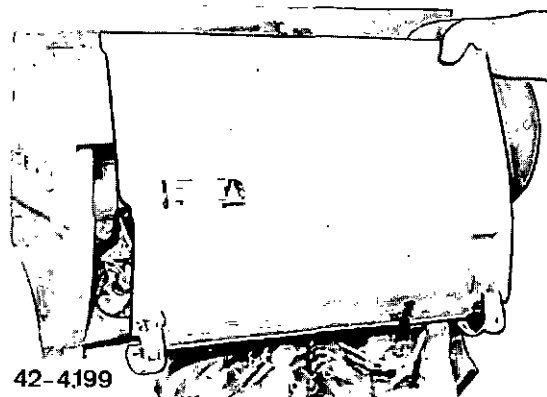


146. Tension V-belt. Tighten bolts in accordance with specifications.

147. Mount holding bracket.



148. Mount air cowling.

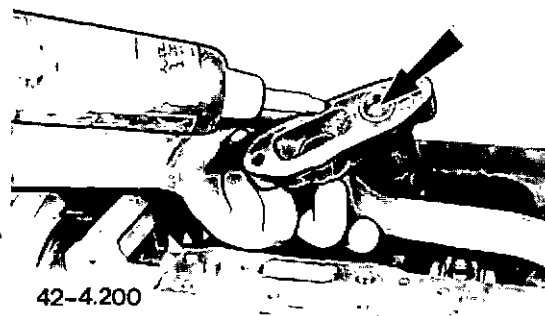


149. Spread sealing surface of oil suction housing with Deutz DW 67.

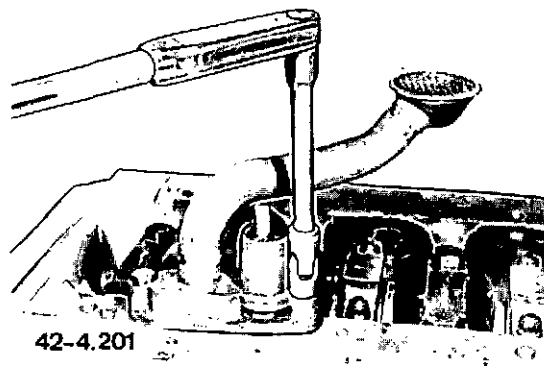
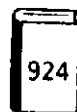


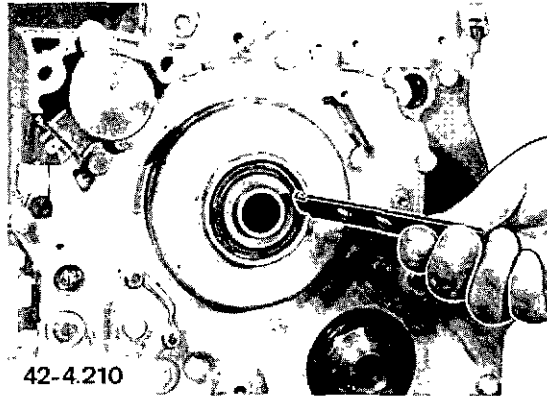
Note:

Make sure that no sealing paste penetrates into pressure valve bore.



150. Mount oil suction housing. Tighten bolts in accordance with specifications.

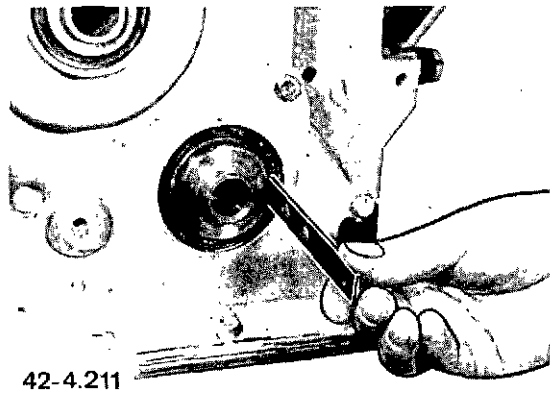




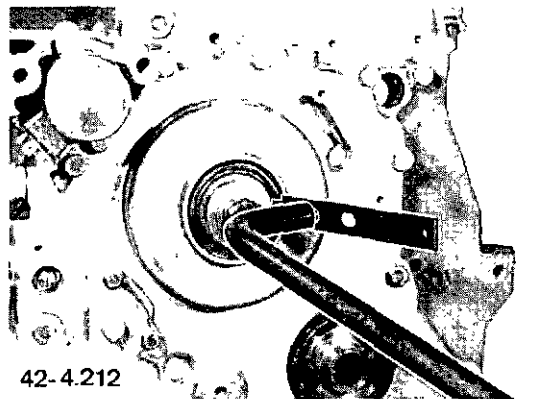
- Front cover -

Toothed belt guard/camshaft and crankshaft gears have been removed.

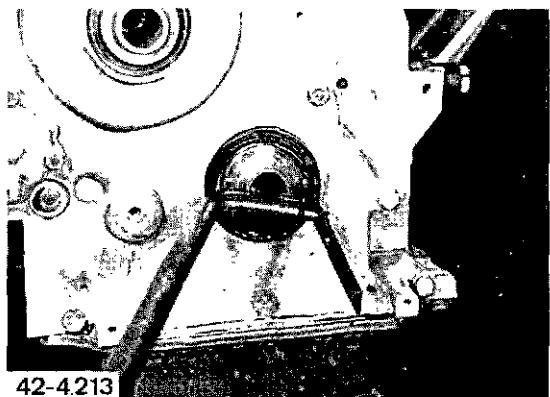
1. Press angle hook into seal of camshaft



and crankshaft.



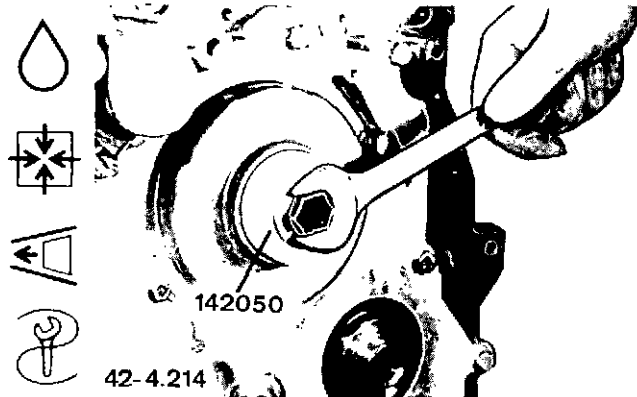
2. Lever out seal for camshaft



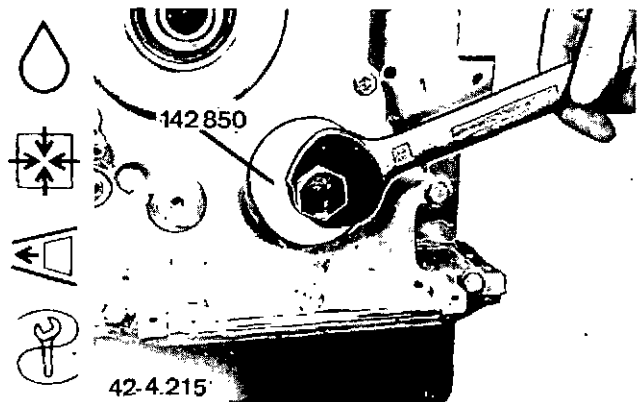
and crankshaft using puller.

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3. Oil sealing lips. Fit seal for camshaft



and crankshaft using press-in device.



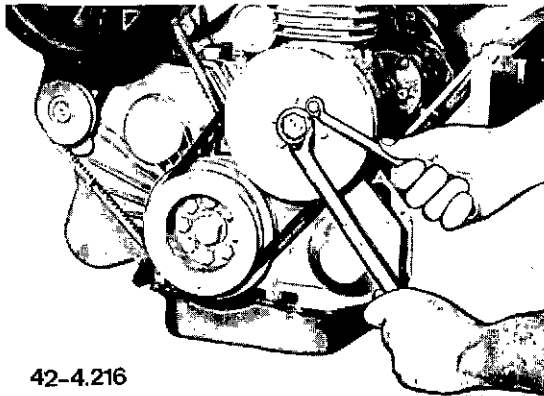
Note:
After having fitted shaft seals basic setting of „camshaft relative to crankshaft“ has to be redone (see pages 4/24 – 4/33).



Removal and refitment of air compressor

Commercial tools required:

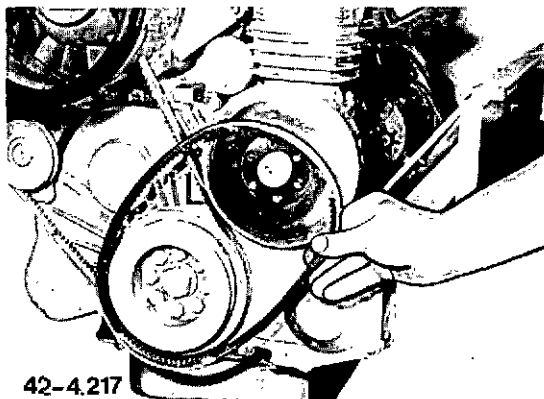
V-belt tension gauge..... 91107



42-4.216



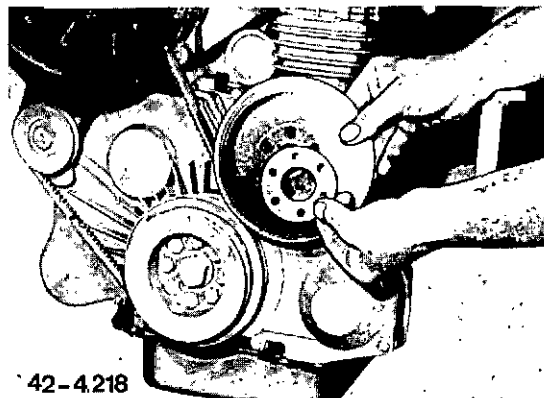
1. Remove outer V-belt half-pulley together with shims.



42-4.217



2. Remove V-belt.

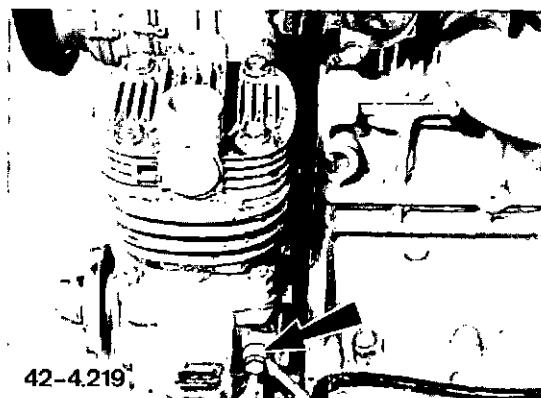


42-4.218

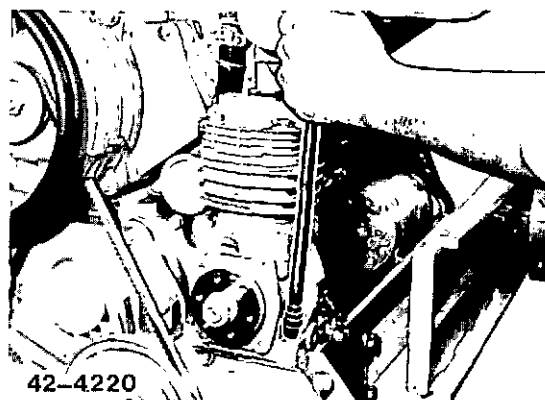


3. Remove shims and inner V-belt half-pulley.

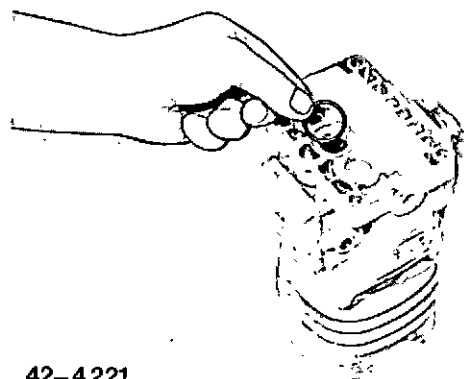
4. Take down lube oil pipe.



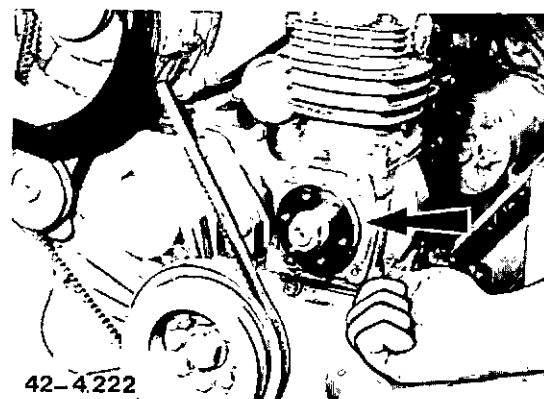
5. Remove air compressor.



6. Insert new O-seal, using grease.

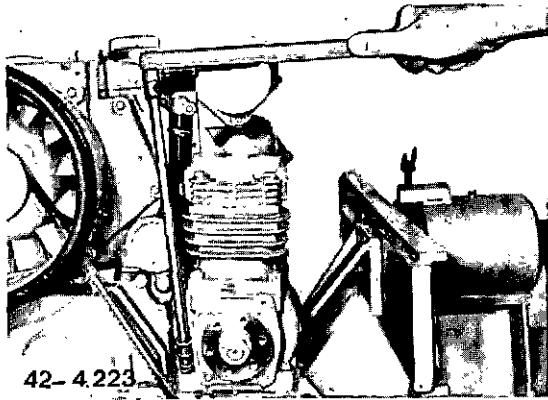


7. Fit air compressor in place, as indicated by arrow.

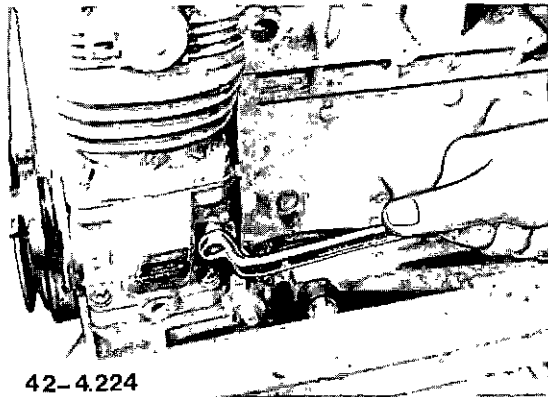


Disassembly and reassembly of complete engine

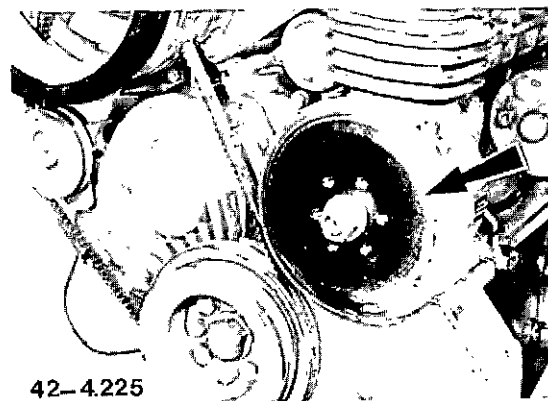
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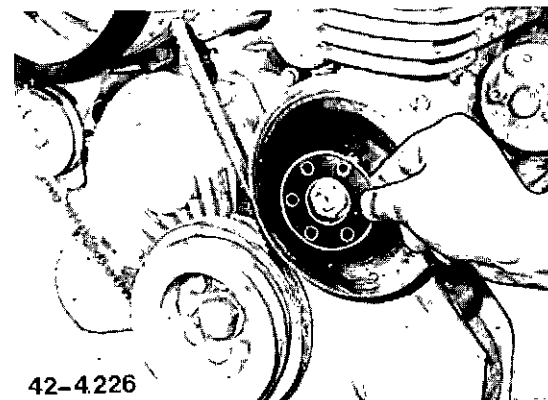
8. Tighten bolts.



9. Fit lube oil pipe together with new Cu sealing rings.



10. Position inner V-belt half-pulley.

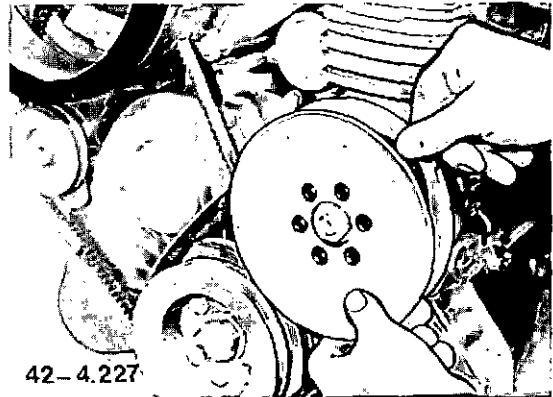


11. Position removed shims.

4

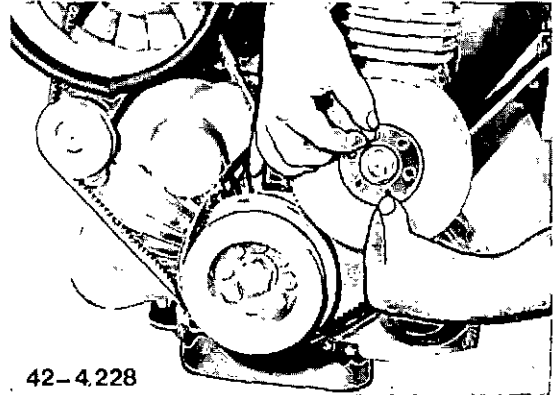
42-4.226

12. Fit V-belt and outer V-belt pulley.



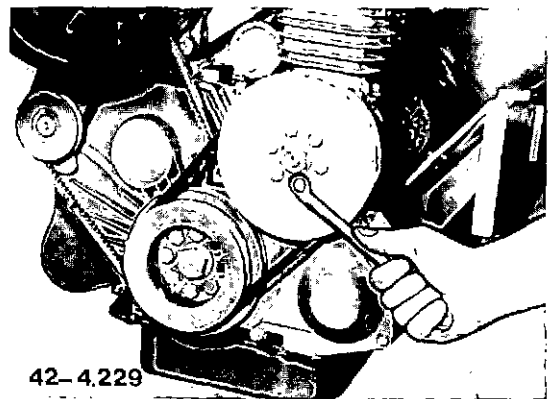
42-4.227

13. Position remaining shims, if provided.
Finger start the bolts.



42-4.228

14. Tighten bolts while turning engine over.



42-4.229

15. Check belt tension.
In case of failure to attain the specified scale reading, repeat procedure.



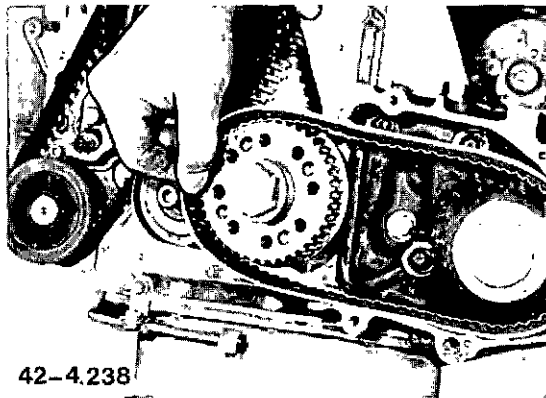
V-belt tension.:
Tension of new belt: 510 Nm.
Retension after 20 min.: 410 Nm



42-4.230

Disassembly and reassembly of complete engine

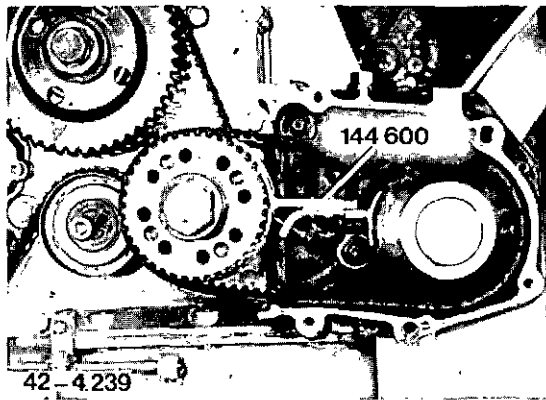
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42-4.238



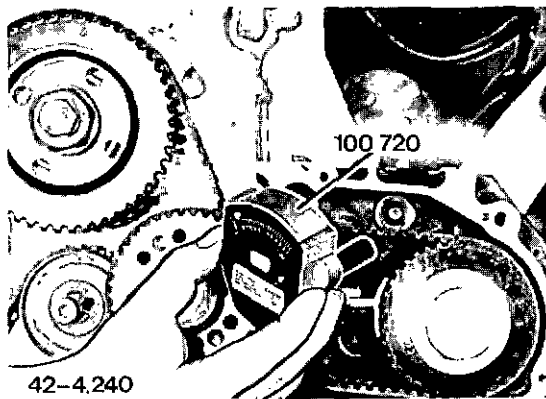
6. Position toothed belt.
On crankshaft gear as far as rear guide plate and on hydraulic pump gear with approx. 4 mm distance from front edge.



42-4.239



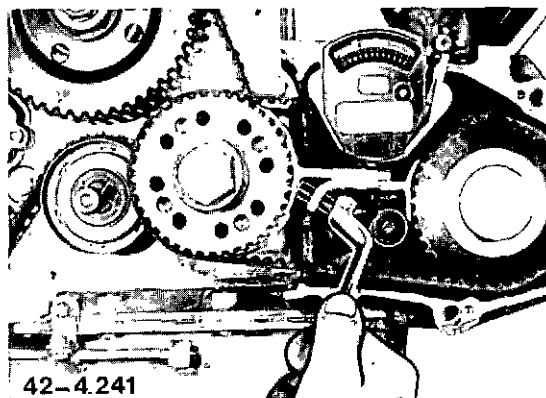
7. Position tensioning device.



42-4.240



8. Position toothed belt tension gauge.



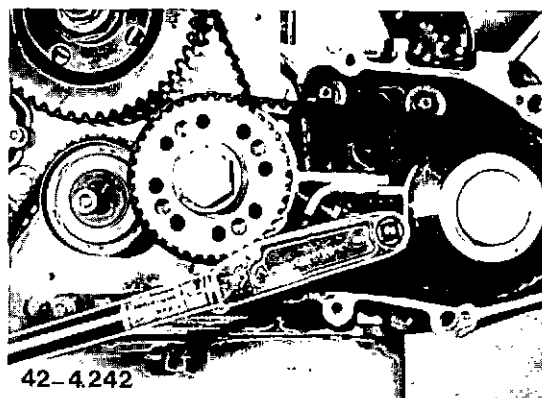
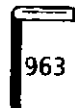
42-4.241



9. Tension toothed belt with tensioning device so as to attain a scale reading between 10.5 and 11.5.

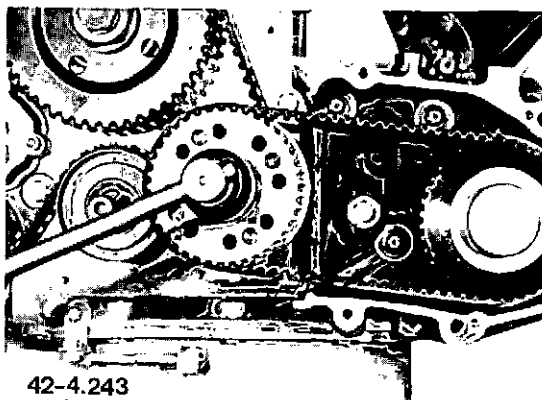
Remove tension gauge.

10. Tighten fastening bolts of bracket in accordance with specifications.



11. Remove tensioning device.

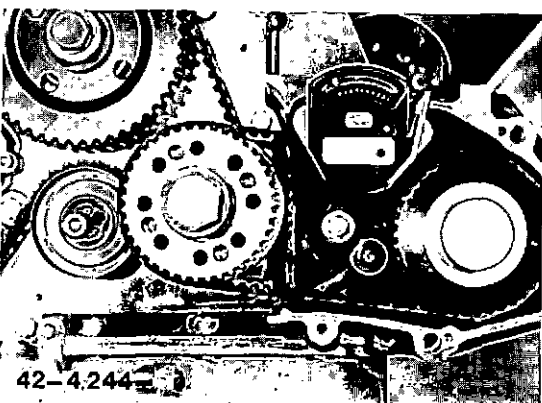
Turn crankshaft one revolution in direction of engine rotation.



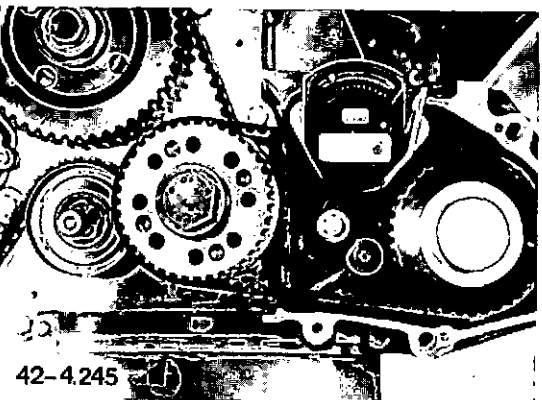
12. Position toothed belt tension gauge.

Take reading.

Specified scale reading: 10 to 12.

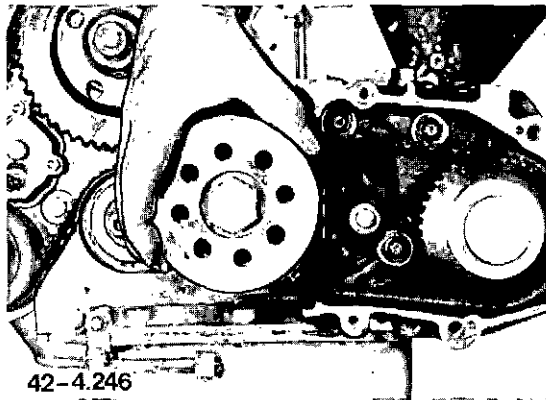


13. In case of failure to attain the specified scale reading, repeat procedure.



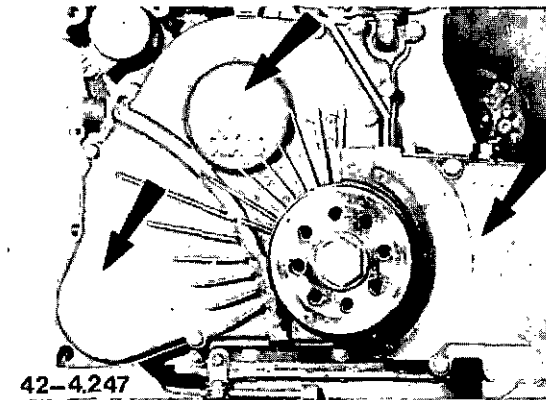
Disassembly and reassembly of complete engine

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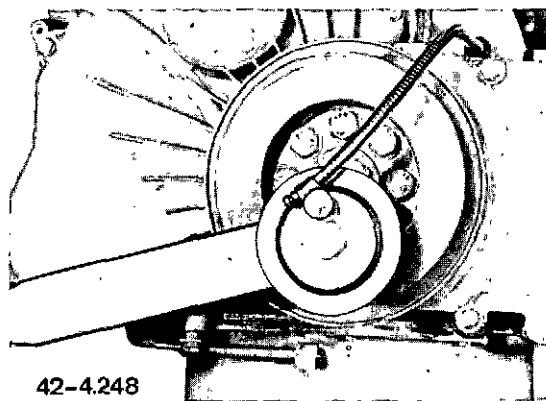
42-4.246

14. Position shim with chamfered side facing the engine.



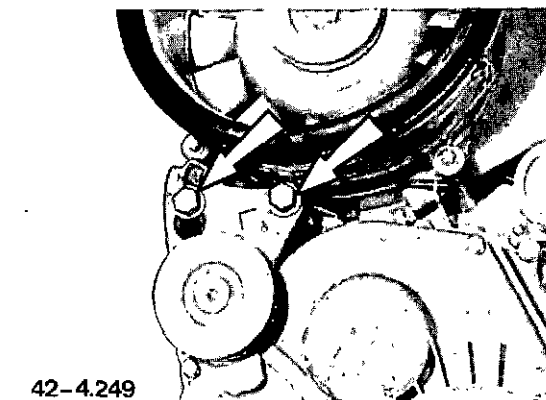
42-4.247

15. Replace toothed belt guard.



42-4.248

16. Refit V-belt pulley, tighten bolts in accordance with specifications.



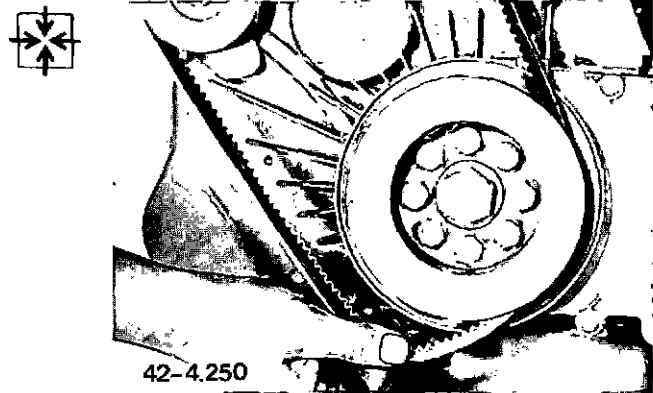
42-4.249

17. Fit V-belt idler pulley.

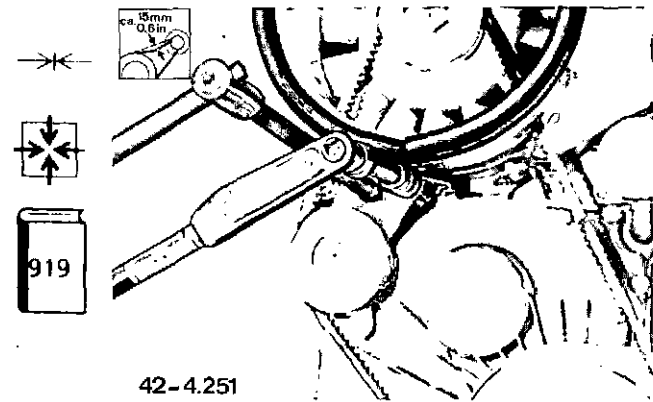
Note:
Turn bolts lightly.

4

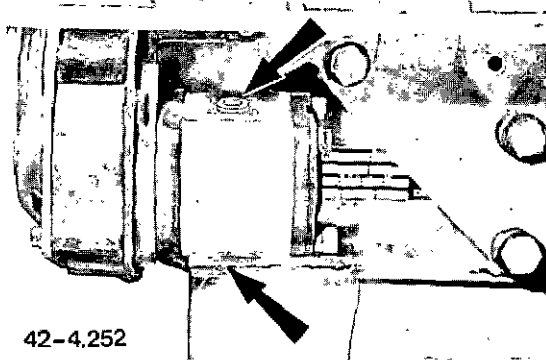
18. Position V-belt.



19. Tension V-belt.
Tighten bolts in accordance with specifications.



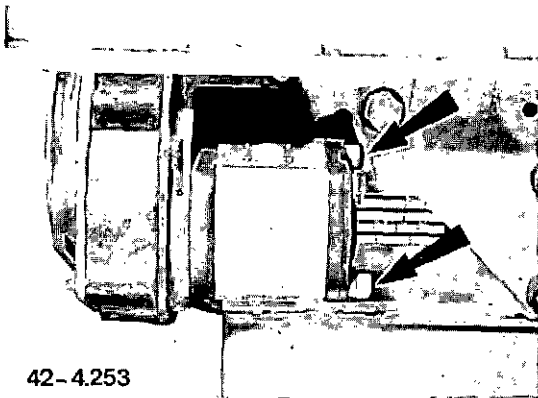
Werkstatthandbuch B/FL 1011/T



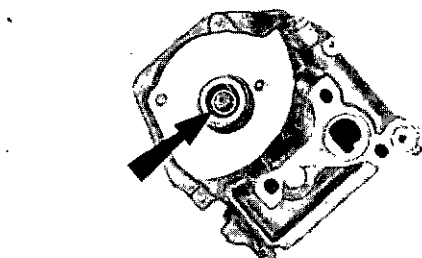
Removal and refitment of hydraulic pump:

1. Release connections.

Note:
Close openings.

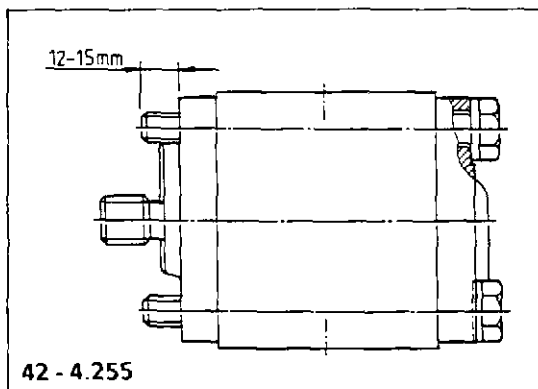


2. Take down hydraulic pump.



3. Make sure that a coupling sleeve is fitted.

42-4.254

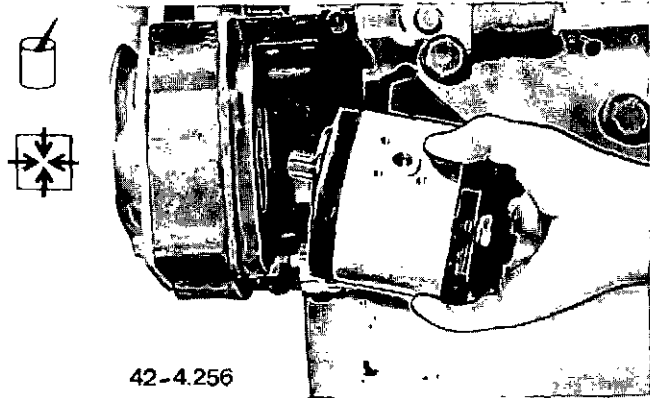


4. Fit fastening bolts together with washers.
Measure projection.

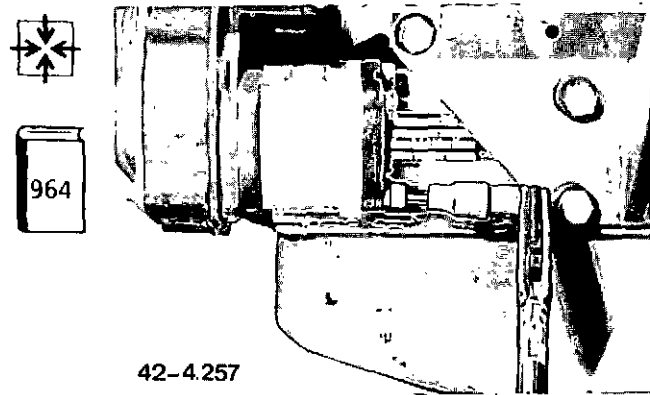
4

Werkstatthandbuch B/FL 1011/T

5. Apply graphite grease to serrated shaft, mount hydraulic pump.

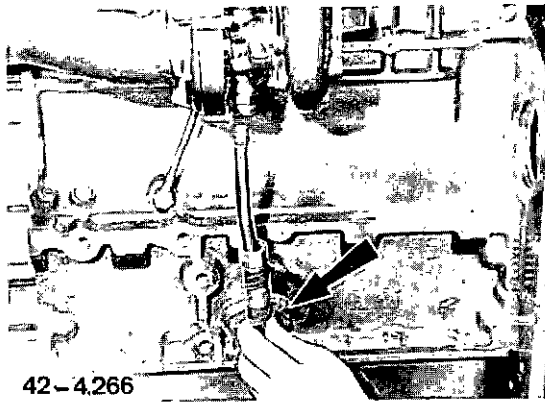


6. Tighten bolts in accordance with specifications.



Disassembly and reassembly of complete engine

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9. Fit oil return pipe with gasket.
Tighten cap nut in accordance
with specifications.,

Table of Contents

5. Turbocharger	PAGE
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Dismantling	5/1-5/3
Cleaning and inspecting of the parts.....	5/4
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Permissible Wear	5/13
Determining play at the Bearings	5/14
Data Sheet	5/15
Sectional Illustrations	

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



Gültig: 5900 008 25 32 07.89 D

Ersetzt: 5900 008 25 32 03.87 D

The numbers in brackets are the item nos. of the parts concerned. (See: Turbocharger parts description and sectional illustrations).

1. DISMANTLING

1.1 Turbine housing (25) and compressor housing (22).

- Mark the position of the housing with respect to the bearing housing (1) and backplate (17).

Illustration 1.1.1

- Using a vice, clamp the turbine housing (25) at the gas inlet flange. (Use vice jaw guards).

- Remove the fixings (23, 24, 27, 28) from the compressor housing (22) and turbine housing (25).

Illustration 1.1.2

- Remove the turbine housing (25) (when tight, heat at the tight sections)

- Remove the compressor housing (22), when tight loosen, using rubber hammer.

Attention:
Danger of blade damage when tilted.

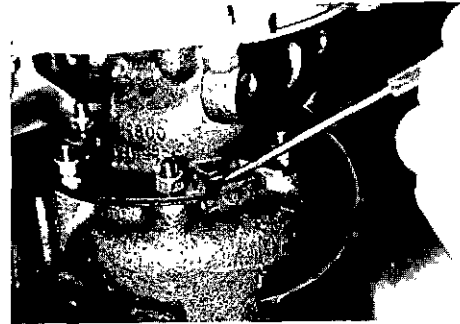
1.2 Compressor Wheel (20)

- Clamp the hub of the shaft and turbine wheel assy. (5) in the special vice jaw plates (See: Repair Tools). Illustration 1.2.1

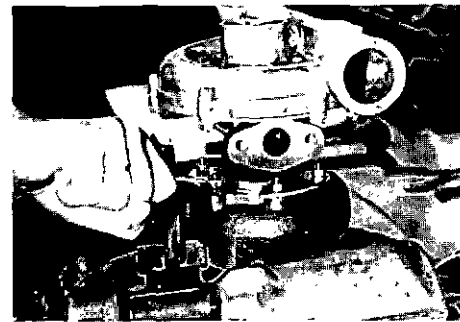
- Remove the shaft nut (21), using T spanner.

- When the shaft nut is jammed heat to a max. temperature of 130° C, using hot air blower (See: Repair Tools; the threads of the shaft and turbine wheel assy. (5) must be protected from overheating during this process). Illustration 1.2.2

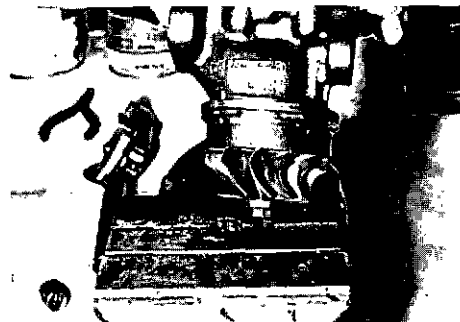
Attention:
Shaft nut (21) is secured with LOCTITE 640. Take care to incur no bending effects on shaft during shaft nut removal.



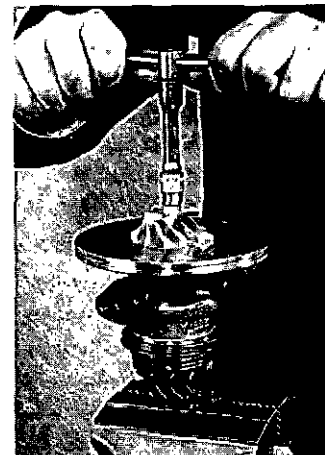
1.1.1



1.1.2



1.2.1



1.2.2

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled


Turbolader

Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

- Heat compressor wheel (20) to a max. temp. of 130° C, using hot air blower (See: Repair Tools) (Protect the rotor threads from overheating), and carefully push out shaft and turbine wheel assy. (5), using a press (a vertical drilling machine). Illustrations 1.2.3, 1.2.4

Attention:

Fit heat shield (31) concentrically.

1.3 Bearing Housing (1)

- Carefully remove the shaft and turbine wheel assy. (5) from the bearing housing (1).

- Remove piston rings (6) from shaft and turbine wheel assy. (5). Illustration 1.3.1

- Remove heat shield (31).

- Clamp bearing housing (1) in vice between the oil feed and return flanges.

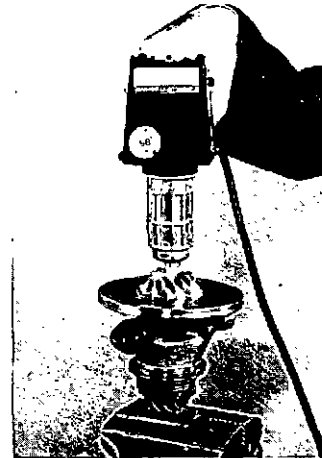
Remark:

Use vice jaw guards.

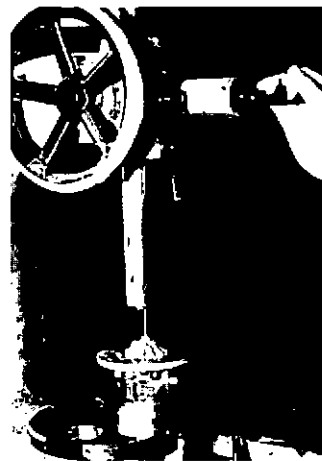
- Remove the fixing screws (18). Illustration 1.3.2

Attention:

Fixing screws (18) are secured with LOCTITE 640.



1.2.3



1.2.4



1.3.2



1.3.1

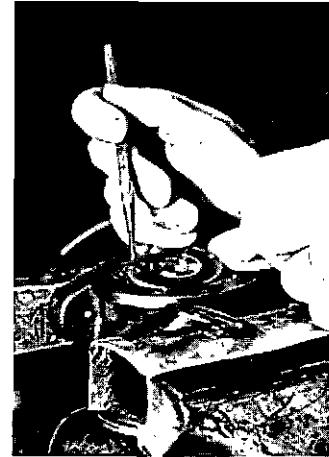
REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

- Remove backplate (17) from bearing housing (1).
- Press flinger sleeve (11) out of backplate (17).
- Remove O-rings (16,34), from backplate.
- Remove piston rings (6) from flinger sleeve (11):
- Remove oil deflector ring (11), oil deflector (13) and thrust bearing (10) from bearing housing (1). **Illustration 1.3.3**



1.3.3

- Remove spacer sleeve (9) and thrust ring (8) from bearing housing (1). **Illustration 1.3.4**



1.3.4

- Remove snap rings (2) and bearings (3). (For snap ring pliers see: Repair Tools). **Illustrations 1.3.5, 1.3.6**



1.3.6



1.3.5

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 09.88 D

2. CLEANING AND INSPECTING OF THE PARTS.

2.1 Cleaning of the parts

- Carefully clean all parts: housings (1,22,25), shaft and turbine wheel assy. (5), compressor wheel (20), backplate (17) and heat shield (31) must be wet sand-blasted.
- Threads of the shaft and turbine wheel assy: remove the LOCTITE residues!

ATTENTION:
The bearing holes and piston ring sealing surfaces of the bearing housing (1), the shaft of the shaft and turbine wheel assy. (5) and the piston ring sealing surface of the backplate (17) must be protected from the blasting medium.

2.2 Checking the parts

2.2.1 Visual check

- Examine housings (1,22,25), heat shield (31) and turbine and compressor wheels for cracks, any foreign matter and scratches. Inspect the oil feed holes in the bearing housing (1) for foreign matter. Inspect piston ring sealing surfaces and bearing areas for damage.
- Examine the turbine housing (25) for scaling.
- Examine the gas inlet and outlet flanges of the turbine housing (25) for distortion.
- Examine the turbine and compressor wheels (5,20), for bend or broken blades and the shaft for scoring at the bearing seats.

LIMITS OF REUSAGE:

Wear parts which have excessive wear (see: permissible wear), as well as rotating parts with cracks must be replaced.

Turbine housing: Radial cracks up to 10 mm long are permissible in the vicinity of the tongue and the partitioning wall. Illustrations 2.2.1.1, 2.2.1.2

Cracks which are fully through the material are not permissible. Light scratching at the contour is permissible.

When scaling occurs at bridge of the gas inlet flange and contour, the part must be replaced. When deformity occurs at the gas inlet and outlet flanges, such parts must be replaced.

Shaft and turbine wheel assembly: Do not straighten any bent blades. When blades are bent, the shaft and turbine wheel assy. must be replaced.

Shaft and turbine wheel assy. with scratching and cracks must be replaced.

2.2.2 Checking of dimensions

- Place the shaft and turbine wheel assy. (5), supported at the bearing points, in the twin V-blocks (See "Repair Tools").
- Set the clock gauge feeler on the shaft, 5 mm from the compressor wheel end of the shaft.
- During measurement, press shaft firmly into V-blocks, distributing the pressure equally.
- When it is more than 0.008 mm out of truth, replace the shaft and turbine wheel assy (5). Illustration 2.2.2

2.3 Dynamic balancing check of rotor assy.

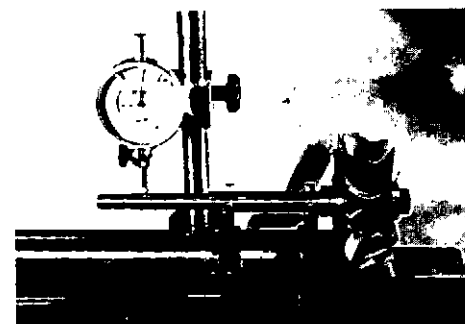
- When the rotating parts are to be used again a dynamic balance check is necessary. Refer to the service information leaflet, code no: 7/03/007.



2.2.1.1



2.2.1.2



2.2.2

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

3. Assembly

• ABSOLUTE CLEANLINESS IS NECESSARY

• The following bearing parts must be oiled before fitting:

- Bearing seat of the shaft
- Bearings (3)
- Thrust bearing (10)
- Flinger sleeve (11)
- Oil deflector ring (11)
- Thrust ring (8)
- Piston rings (6)
- Spacer sleeve (9)

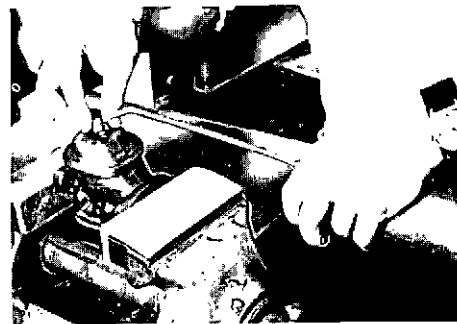
3.1 Bearings (3)

• Fit bearings (3) and snap rings (2) in the bearing housing.

Illustrations 3.1.1, 3.1.3

Attention:

During installation of bearings, particular attention should be paid to cleanliness.



3.1.1



3.1.2



3.1.3

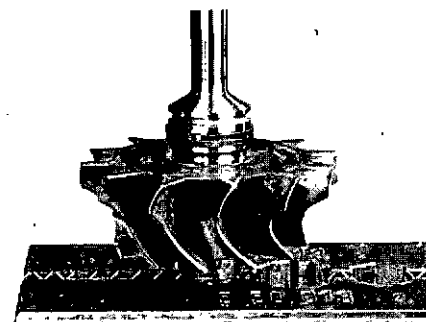
3.2 Bearing housing (1)

• Clamp shaft and turbine wheel assembly (5) in the vice jaw plates equipped with the six/twelve edged cutouts.

• Fit the one/two piston rings (6) to shaft and turbine wheel assembly (5). Attention must be paid to concentricity.

The piston ring slots must be positioned at 180° to another.

Illustration 3.2.1



3.2.1

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



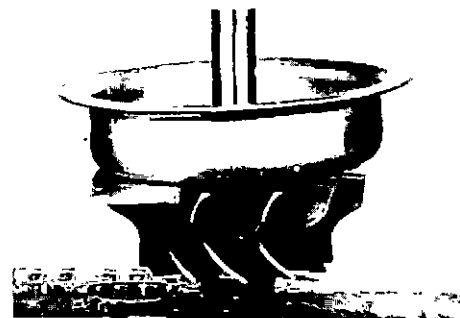
Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

- Place heat shield (31) concentrically on shaft and turbine wheel assembly. (5).

For K1:

- Insert a strip of sheet metal 1 mm thick between heat shield and turbine wheel backside (to ensure that the piston ring is guided inside the bearing housing bore).

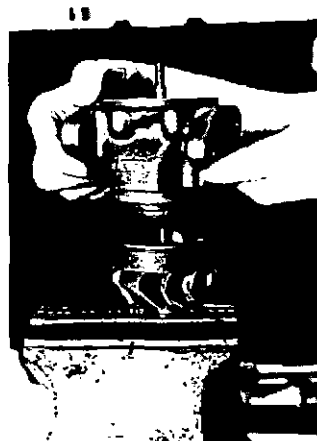
Illustration 3.2.2



3.2.2

- Guide bearing housing (1) carefully onto rotor shaft.

Illustration 3.2.3



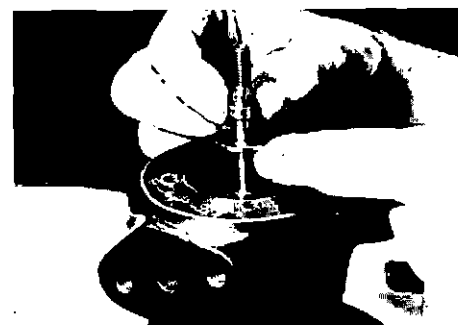
3.2.3

CHECK:

Piston rings (6) are properly seated, when heat shield (31) and bearing housing (1) turn freely.

- Guide thrust ring (8) and spacer sleeve (9) onto rotor shaft.

Illustration 3.2.4



3.2.4

- Place thrust bearing (10) in bearing housing (1).

Illustration 3.2.5

- Place a new oil deflector plate (13) on thrust bearing (10).

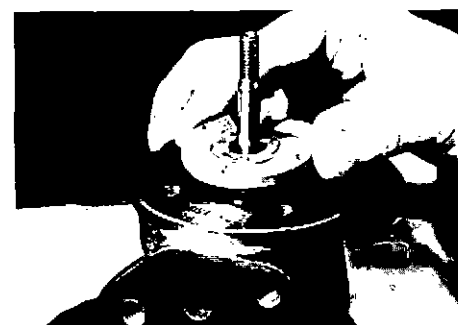
Illustration 3.2.6

- Arrangement with oil deflector ring: Guide the oil deflector ring (11) onto the rotor shaft with the large collar at the top.

- Fit one/two piston rings (6) onto flinger sleeve (11). Position piston ring slots at 180° to one another.



5/6



3.2.5

REPAIR INSTRUCTIONS

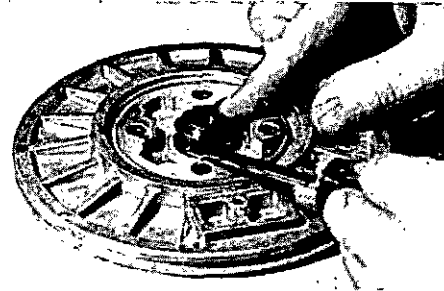
SERIES K1/K2 uncontrolled



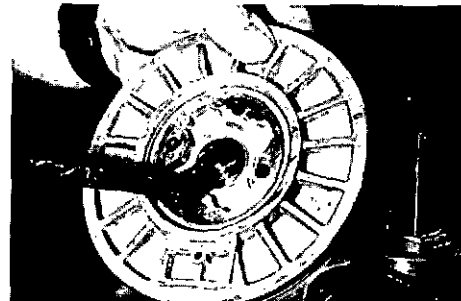
Turbolader

Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

- Insert finger sleeve (11), complete with piston rings (6) into backplate (17). When necessary press piston rings together using screw driver.
Illustration 3.2.7
 - Sealing backplate (17) to bearing housing: Coat sealing face of backplate (17) with LOCTITE 573.
Illustration 3.2.8
 - For constructions with O-ring seals, coat the O-ring (16) with acid-free grease, e.g. SKF ball bearing grease and place in groove provided.
 - Place backplate (17) on bearing housing.
 - Fix backplate (17) to bearing housing (1), using the screws (18) and washers (19). The screws must be secured with LOCTITE 640.
Illustration 3.2.9
 - For tightening torques see: Data Sheet.
- 3.3 Compressor Wheel (20)
- Heat compressor wheel (20) to a max. temp. of 130° C, using hot air blower (See: Repair Tools), or, in a warm/dry oven.
 - Oil the compressor wheel seat of the shaft (e.g. with Shell Ensis 20 W 20).
 - Push warm compressor wheel (20) onto shaft and turbine wheel assy. and, within 5 minutes, tighten a new shaft nut to tightening torque after preheating. After a total cooling time of min. 10 minutes bring up LOCTITE 640 (see mounting sketch), loosen the shaft nut (1 or 2 turns) and tighten to the specified torque and angle setting.
Illustration 3.3.1
 - For tightening torques and angle settings see: Data Sheet.



3.2.7

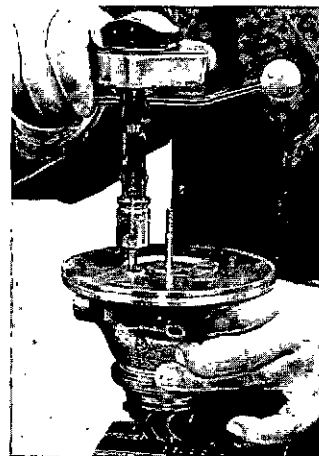


3.2.8

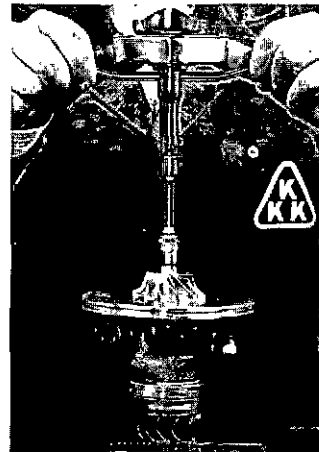
ATTENTION:
When tightening shaft nut take care that no bending effects occur at shaft.

CHECK:
Piston ring (6) is properly seated when heat shield (31) and bearing housing (1) turn freely.

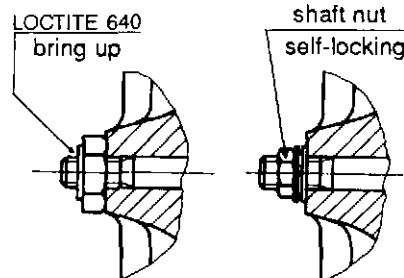
- Plug shaft nut and projecting threads of shaft with security paint.
- Measure the axial and radial plays (See: Determination of bearing play).



3.2.9



3.3.1



Mounting sketch of the shaft nut

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled


Turbolader

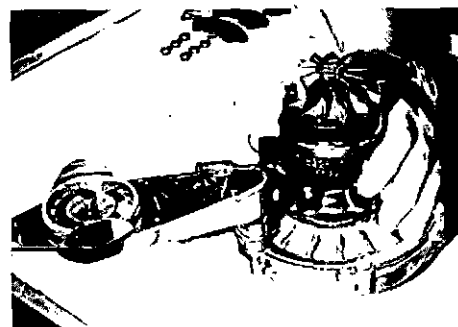
Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

3.4 Compressor housing (22)

- Coat O-ring (34) with brake cylinder paste, e.g. ATE and place in groove in backplate (17).

- Fit compressor housing (22) to backplate (17) in the position marked, using corresponding fixing components (23,24).

Illustration 3.4.1



3.4.1

For tightening torques, see: Data Sheet.

ATTENTION:
Avoid tilting when positioning housing (22).

3.5 Turbine housing (25).

Instal turbine housing (25) in the position marked, using corresponding fixing components (27, 28).

ATTENTION:
Avoid tilting when positioning housing (25).

- Coat fixing screws with heat resistant lubricating paste, e.g. NEVER SEEZ.

- For tightening torques, see: Data Sheet.

3.6 Nameplate (29).

- For turbochargers which have been repaired the blue nameplate (29) must be replaced by a red one, which is fixed with rivets (30).

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



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Ersetzt: 5900 008 25 32 03.87 D

Seite 9

4. REPAIR TOOLS

4.1 Standard tools.

- Ring spanners 10 mm & 13 mm AF
- Socket spanner - With T extension. 10 mm, 12 mm, 14 mm AF
- Torque spanner, Range: 0 - 60 Nm
Sockets: 10 mm, 12mm, 14 mm AF
Square-drive hexagon socket wrench 3/8 "
- Snap ring pliers
KKK Order No: 1550 155; Points: 0,7 mm
- Screw driver, hammer, rubber hammer, vice jaw guards.
- Dial gauge: Scale increment 0,01 mm
Corresponding to clock gauge A1 DIN 878
- Dial gauge: Precision indicator 0,001mm
Correspondig to clock gauge B1-20 DIN 879

4.2 Special tools.

- Splined internal wrench insert.
(Company: Ribe) WN 22000
- Splined srew driver insert for internally-splined socket screws Ribe CV from the company Hommel.
Make: Hazet. Order No: 8809-6 (M6).
- Socket insert (open-ended) for the MANOSKOP torque spanner 10 mm, 13 mm AF
- Hot air blower
e.g. Co. Leister: Leister Hot Air Tool
Type "Ghibli 2"
Order No: 08 L 130
- Transition piece with angle settings, 1/2" drive.
- Vice jaw plates, Drg. No: 1550013
- Inspection device, Drg. No: 1582036
- Support tube

K14: Di	= 54 mm, 100 mm long
K16: Di	= 59 mm, 100 mm long
K24/K26: Di	= 66 mm, 100 mm long
K27: Di	= 84 mm, 100 mm long
K28: Di	= 94 mm, 100 mm long

- Punch Ø 5,2 mm (K1)

- Punch Ø 6,8 mm (K2)

To loosen compressor and turbine housing fixing screws.

To loosen shaft nut.

To tighten shaft nut and fixing screws.

To extract and fit bearing snap rings.

Auxiliary tools.

To check radial and axial play.

To check trueness of shaft and turbine wheel assy.

To loosen and tighten fixings for backplate.

To tighten the fixing screws on the turbine side.

To fit and remove compressor wheel.

To tighten shaft nut.

To clamb hub of shaft and turbine wheel assy during repair.

To check trueness of shaft and turbine wheel assy.

To support the cartridge assy when compressor wheel seizes.

Used together with the supporting tube to dismantle the shaft and turbine wheel assy when compressor wheel seizes.

REPAIR INSTRUCTIONS

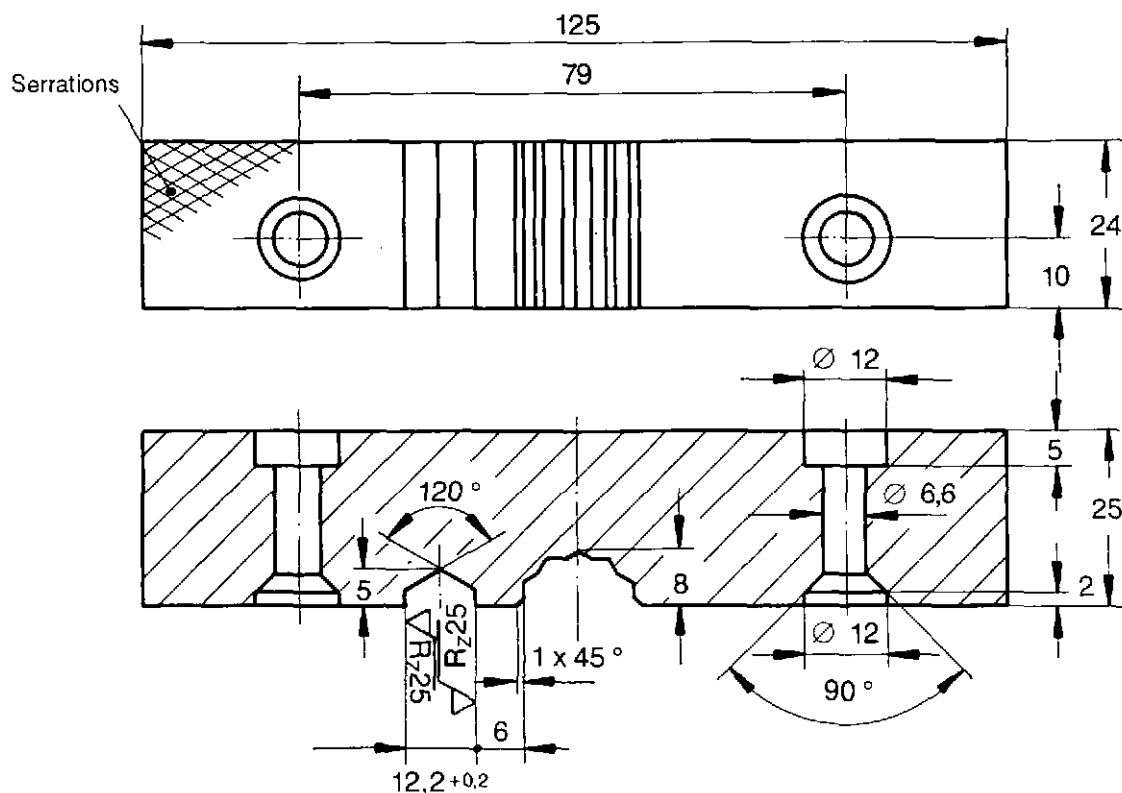
SERIES K1/K2 uncontrolled



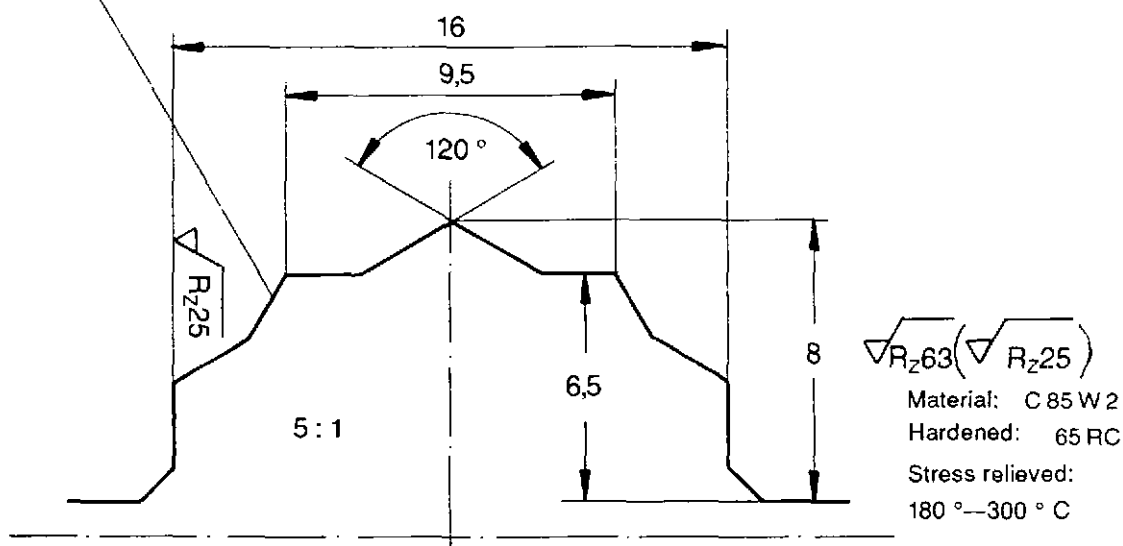
Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

Seite 10

Vice jaw plate (15 500 13)



fitted to suit the rotor



REPAIR INSTRUCTIONS

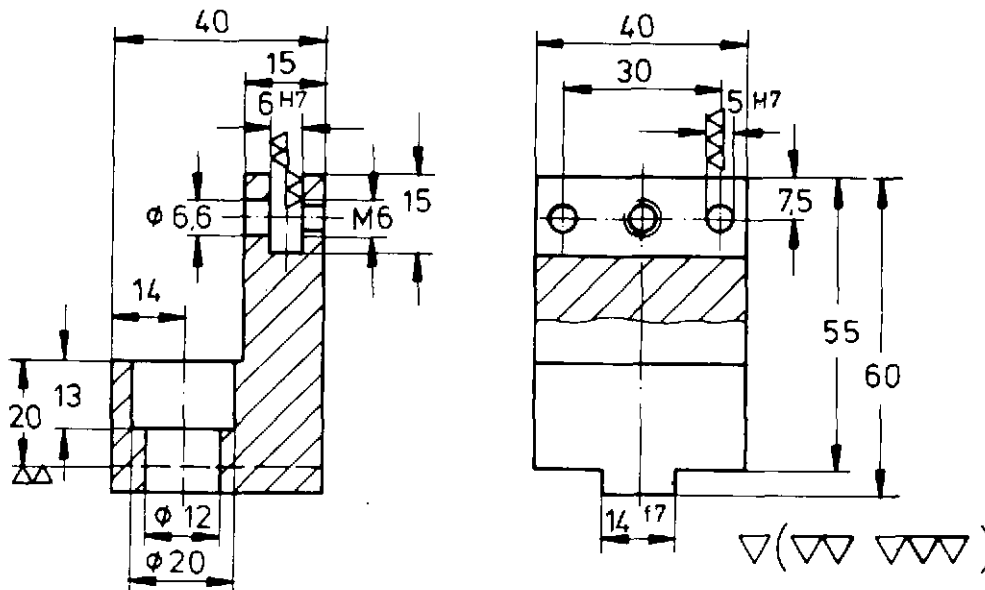
SERIES K1/K2 uncontrolled



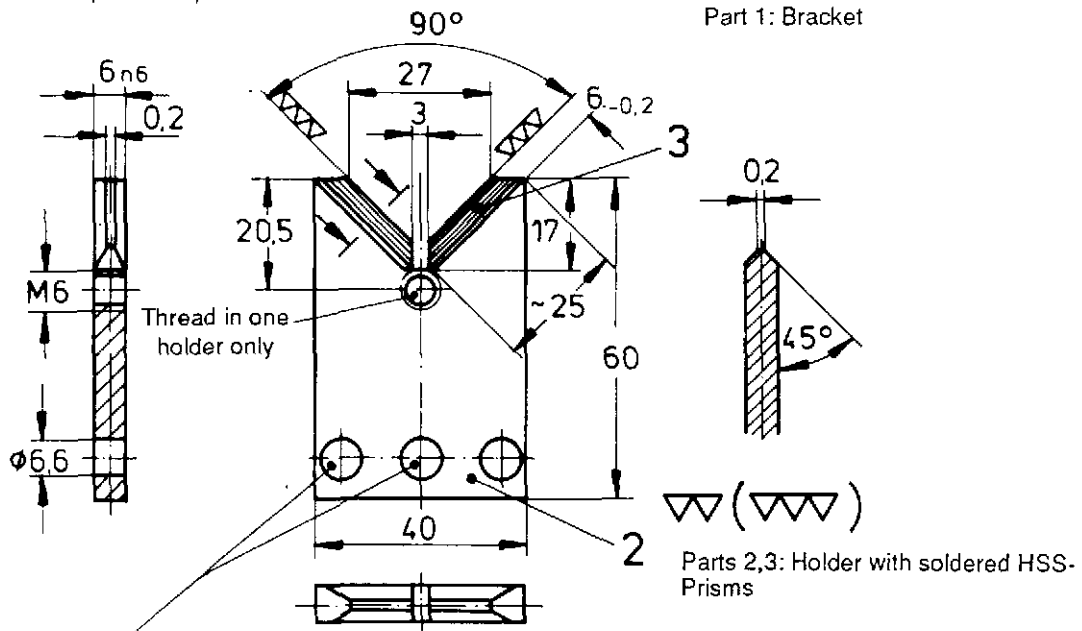
Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

Seite 11

Inspection device for checking rotor
truth (1582036)



Part 1: Bracket



Parts 2,3: Holder with soldered HSS-Prisms

Holes to suit part 1
Teil 2 mit Teil 3 hartgelötet

5

REPAIR INSTRUCTIONS

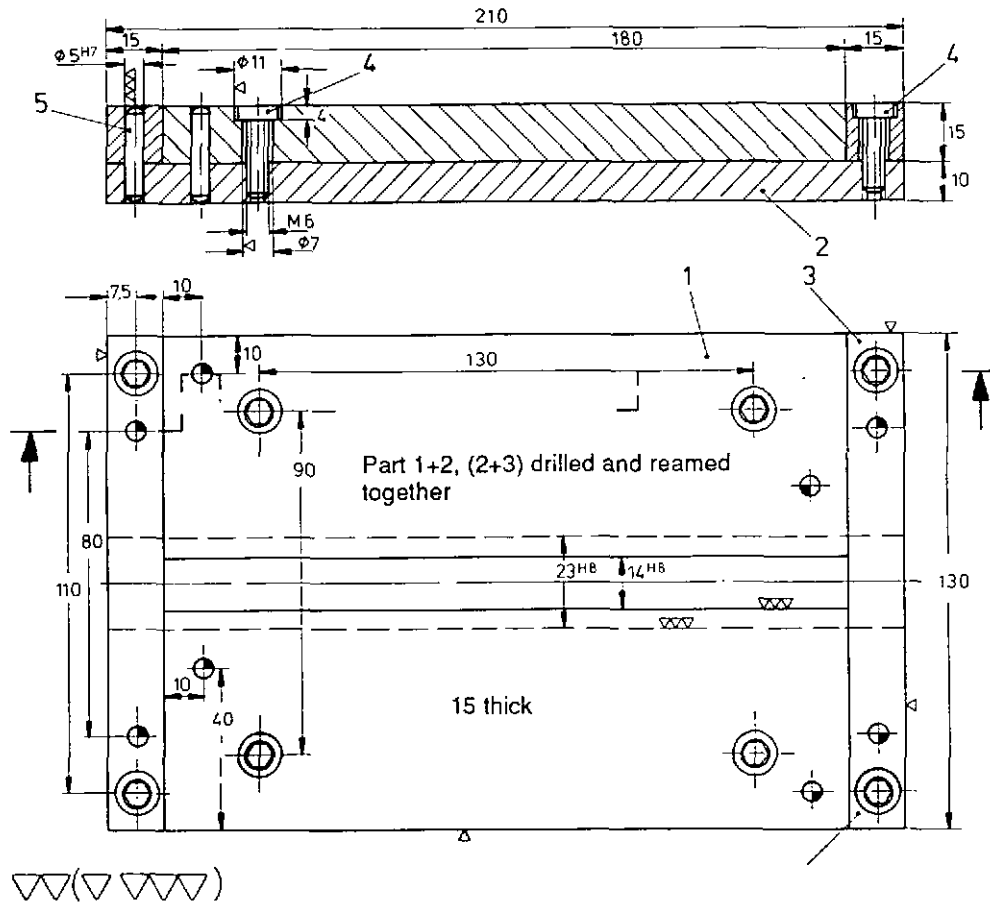


SERIES K1/K2 uncontrolled

Gültig: 5900 008 25 32 07.89 D
Ersetzt: 5900 008 25 32 03.87 D

Seite 12

Inspection device for checking rotor truth (1582036)



Pos.	Piece	Description	Material	Dimension	DIN
1	2	flat steel	St-50K	180 x 60 x 15	17 100
2	2	flat steel	St-50K	210 x 60 x 10	17 100
3	2	flat steel	St-50K	130 x 15 x 15	17 100
4	10	socket head screw	10.9	M6 x 18	7 984
5	8	cylindrical pin	St-50K	5m6 x 20	7
6	2	T- tongue	St-50K	14	508
7	2	socket head screw	10.9	M12 x 25	912
8	4	cylindrical pin	St-50K	5m6 x 15	7

REPAIR INSTRUCTIONS

SERIES K1/K2

uncontrolled

Admissible wear dimensions



Gültig: 5900 008 25 32 07.89 D

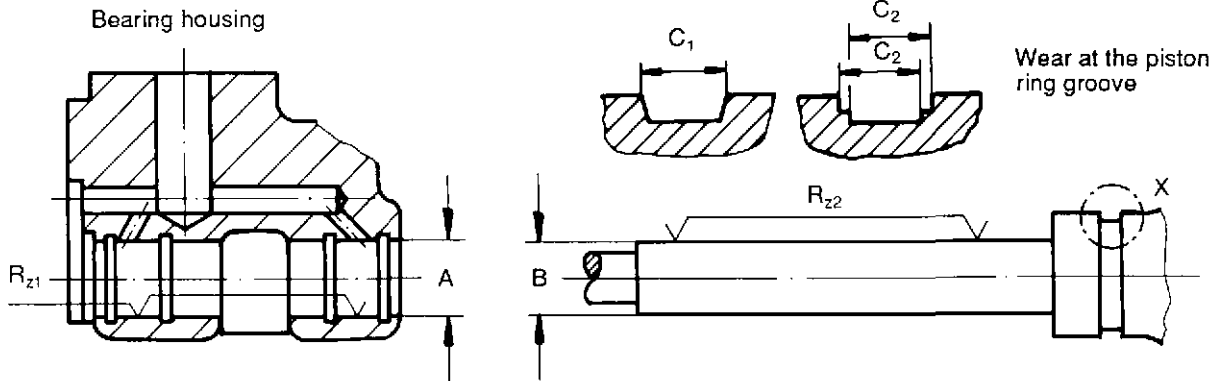
Ersetzt: 5900 008 25 32 03.87 D

Seite 13

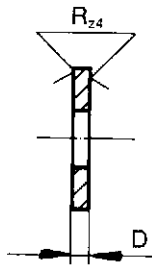
Piston rings and bearing bushes must always be replaced

Shaft and turbine wheel assy

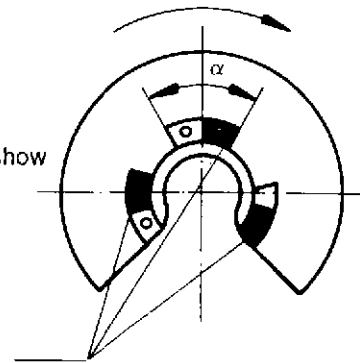
Detail X



Thrust ring



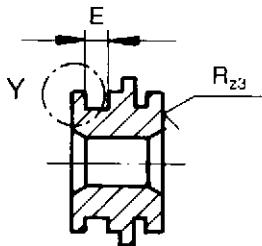
Thrust bearing Rotation



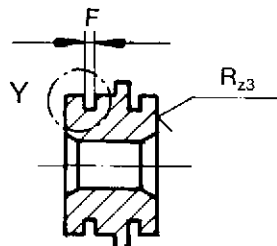
The thrust surfaces may only show running traces of up to $\alpha/2 = 30^\circ$

Flinger sleeve

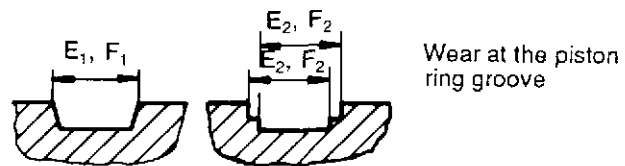
2 Piston rings



1 Piston ring



Detail Y



Dimensions A to F in mm
Dimensions R_{z1} to R_{z4} in μm

Series	A	B	C ₁	C ₂	D	E ₁	E ₂	F ₁	F ₂	R _{z1}	R _{z2}	R _{z3}	R _{z4}		
K 1	13,091	8,469	1,49	1,54	1,47	—	—	1,49	1,54	4	1,6	4	4		
K 2	16,064	9,95	2,89	2,94	1,47	2,89	2,94	1,49	1,54	4	1,6	4	4		

5

REPAIR INSTRUCTIONS

SERIES K1/K2 uncontrolled



Gültig: 5900 008 25 32 07.89 D

Ersetzt: 5900 008 25 32 03.87 D

Seite 14

Determination of Bearing Play

1. Measuring the axial play

- Place measuring point of clock gauge on top face of turbine wheel hub.

Illustration 1.1

- Press down shaft and turbine wheel assy. against clock gauge and set the clock gauge at "0".

- Press shaft and turbine wheel assy. against clock gauge and note indicator "throw".

- The permissible axial plays can be seen in the data sheet.

2. Measuring the radial play

- Determination of radial play is only necessary at turbine side.

- Place clock gauge measuring point on the centre of the cone on the turbine wheel.

Illustrations 2.1, 2.2

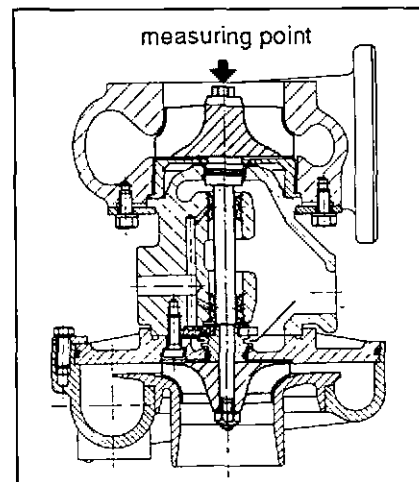
- Pull turbine wheel downwards using spring scale. Measuring force: 50 N. Set clock gauge at "0"!

- Pull turbine wheel upwards using spring scale. Measuring force 50 N.

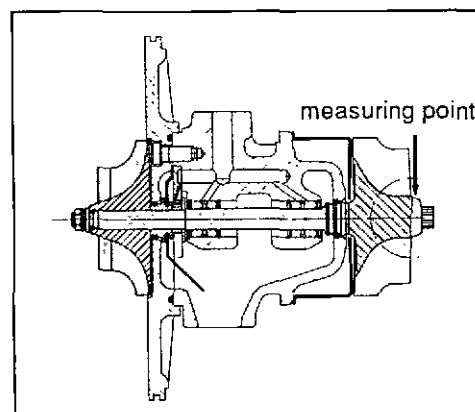
- Note the clock gauge "throw".

- Take this measurement again, with shaft and turbine wheel assy. turned through 90°.

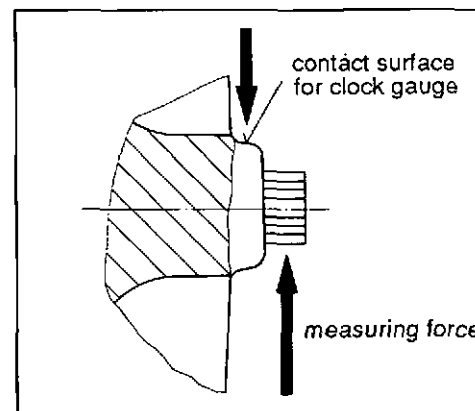
- The permissible radial plays can be seen in the data sheet.



1.1



2.1



2.2

REPAIR INSTRUCTIONS

SERIES K1/K2

uncontrolled

Data Sheet



Gültig: 5900 008 25 32 07.89 D

Ersetzt: 5900 008 25 32 03.87 D

Seite 15

1. Tightening torques in Nm

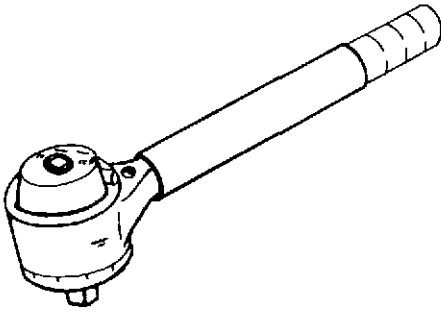
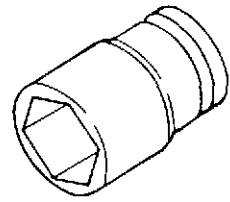
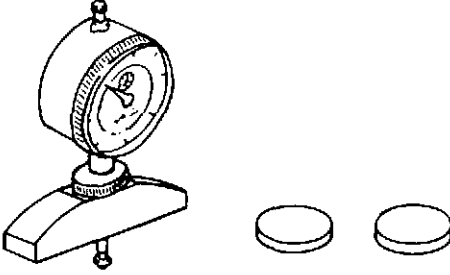
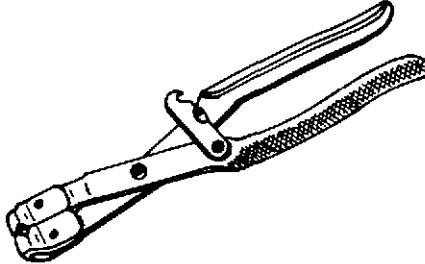
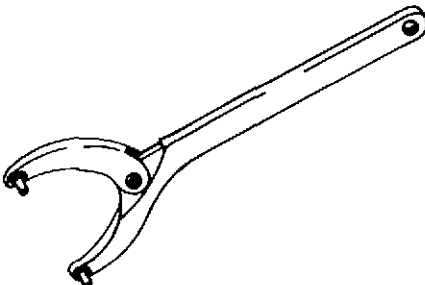
part		size	K14/K16	K24	K26	K27	K28	K29
shaft nut	AF 10/12 mm self-locking M 6	tightening torque after preheating	—	5 ⁺²			—	—
		tightening torque	—	12 ⁺¹			—	—
	AF 10/12 mm M 6	tightening torque after preheating	—	7 ⁺²			—	—
		tightening torque + angle setting	—	5 ^{+60° -5°}			—	—
	AF 14 mm M 6	tightening torque after preheating	—	7 ⁺²			—	—
		tightening torque + angle setting	—	5 ^{+60° -5°}			—	—
AF 10 mm M 5	tightening torque after preheating	5 ⁺²	—			—	—	
	tightening torque	6 ^{+0.5}	—			—	—	
backplate fixing without washer			—	8			—	—
backplate fixing with washer			6	10			—	—
compressor housing			7			—	—	—
turbine housing (M 6)			8			—		—
turbine housing (M 8)			20		22,5			—

2. Axial play in mm

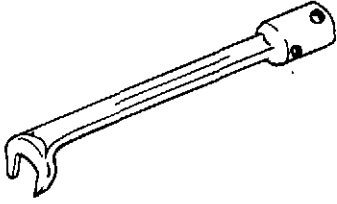
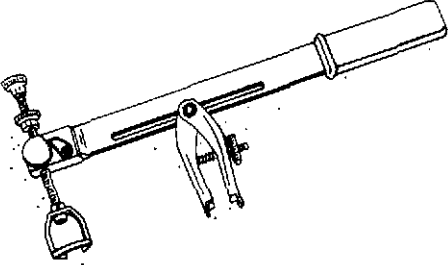


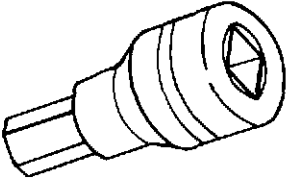
size	K14/K16	K24	K26	K27	K28	K29
max. play	0,10	0,16			—	—

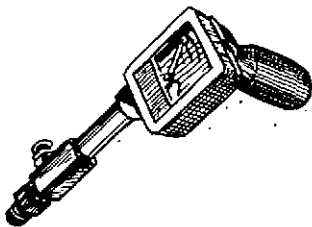
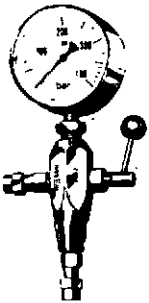
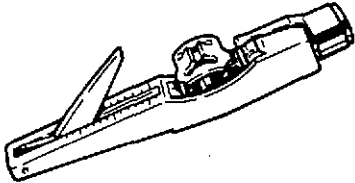
3. Radial play in mm

size	K14/K16	24	K26	K27	K28	K29
max. play	0,35	0,42		0,46		

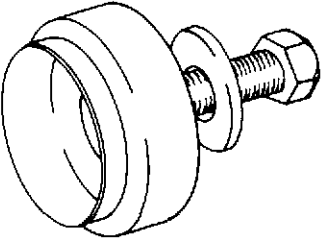
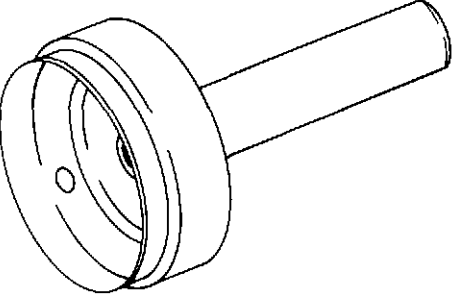
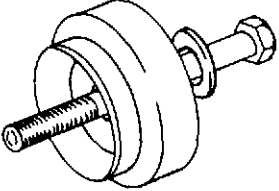
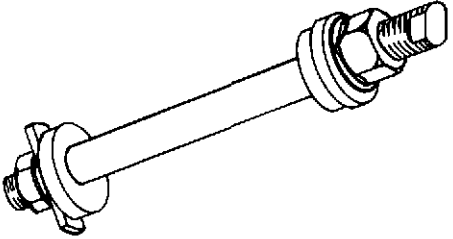
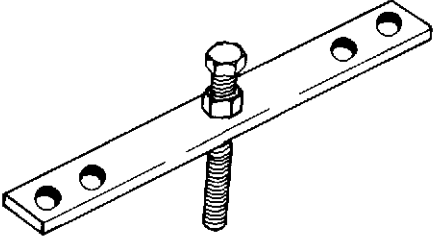
<p>No.</p> <p>STW 392</p> <p>030 1124</p>	<p>Multipower tool for central bolt.</p>	
<p>SW 32</p> <p>030 1083</p>	<p>Socket 60 JMP.</p>	
<p>TM2</p> <p>030 1084</p>	<p>Depth gauge with spacer discs.</p>	
<p>2465</p>	<p>Hose clip pliers</p>	
<p>764</p> <p>030 1086</p>	<p>Special two-pin spanner, swivel-type</p>	

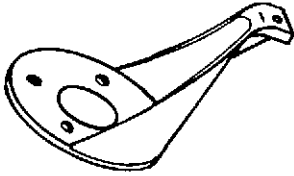
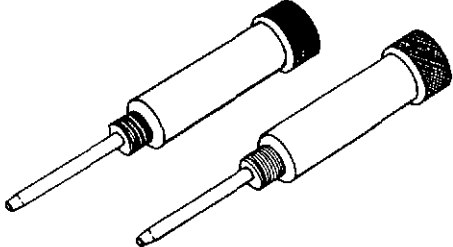
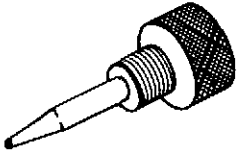
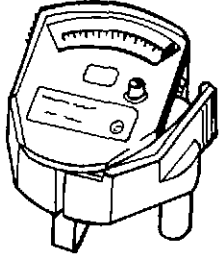
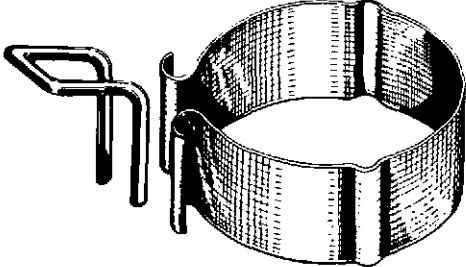
Tools

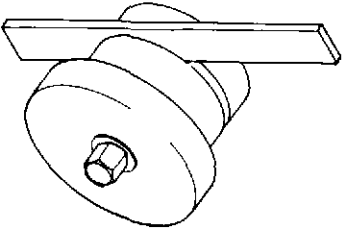
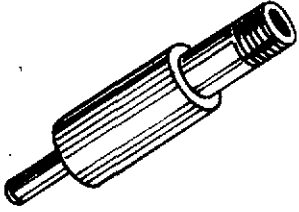
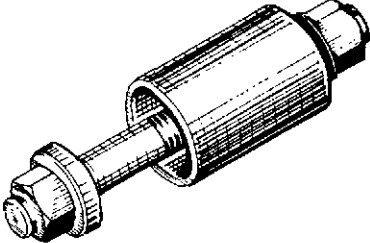
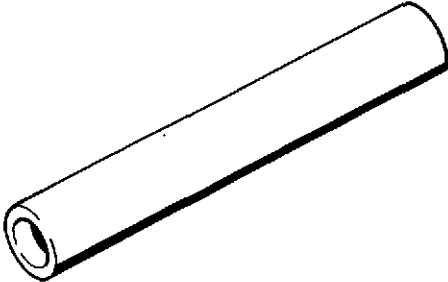
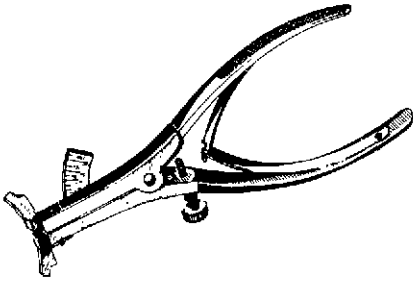
	<p>Crowfoot spanner SW 13 a/flats 13</p>	<p>No. 380 030 1087</p>
	<p>Valve spring assembly lever</p>	<p>210 450 030 1088</p>
	<p>Torx tool kit</p>	<p>8189 030 1089</p>
	<p>Bent spanner for starter a/flats 13 x 17</p>	<p>304 030 1090</p>
	<p>Screw driver socket 1/2" a/flats 17</p>	<p>740 C 030 1091</p>

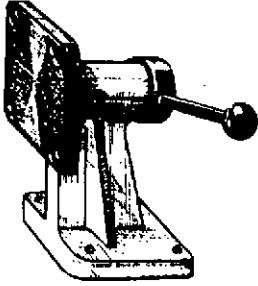
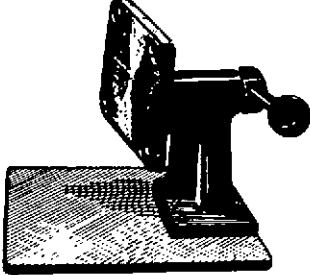
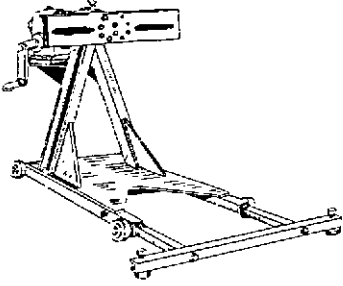
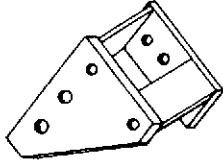
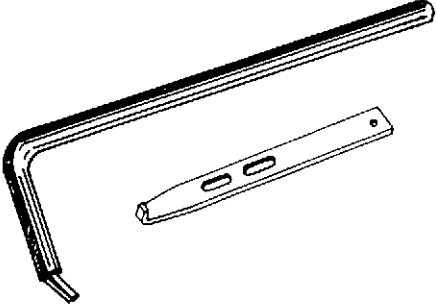
<p>No.</p> <p>2461</p> <p>030 1156</p>	<p>Compression tester</p>	
<p>3202</p> <p>003 1077</p>	<p>Injection pump tester</p>	
<p>91107</p> <p>030 1095</p>	<p>V - belt tension gauge</p>	


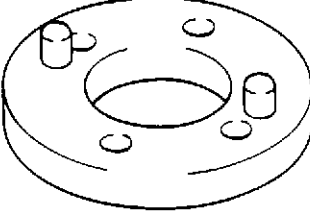
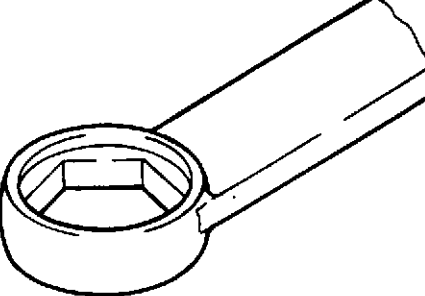
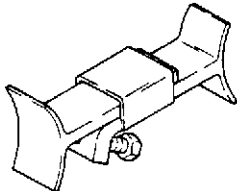
Tools

	<p>Assembly tool for crankshaft seal, front</p>	<p>No.</p> <p>142 850</p> <p>030 1096</p>
	<p>Assembly tool for crankshaft seal, rear</p>	<p>142 860</p> <p>030 1097</p>
	<p>Assembly tool for camshaft seal</p>	<p>142 050</p> <p>030 1098</p>
	<p>Assembly tool for camshaft sleeve</p>	<p>143 720</p> <p>030 1099</p>
	<p>Puller for flywheel</p>	<p>143 100</p> <p>030 1111</p>

<p>No.</p> <p>143 420</p> <p>030 1125</p>	<p>Dolly for multipower tool</p>	
<p>100 700</p> <p>030 1093</p>	<p>Adjusting pin for crankshaft and camshaft</p>	
<p>100 710</p> <p>030 1094</p>	<p>Adjusting pin for injection pump control rod</p>	
<p>100 720</p> <p>030 1095</p>	<p>Device for measuring toothed belt tension</p>	
<p>130 510</p> <p>003 0473</p>	<p>Piston ring compressor</p>	

	<p>Assembly tool for control rod bush</p>	<p>No. 110 100 030 1112</p>
	<p>Adapter for compression tester</p>	<p>100 090 030 1120</p>
	<p>Assembly tool for small end bush</p>	<p>131 340 030 1121</p>
	<p>Sleeve for fitting valve stem seal</p>	<p>121 410 030 1122</p>
	<p>Universal piston ring pliers</p>	<p>130 300 003 0496</p>

<p>No.</p> <p>120 900</p> <p>003 0562</p>	<p>Clamping stand for cylinder heads</p>	
<p>120 910</p> <p>003 0794</p>	<p>Clamping plate for 120 900</p>	
<p>6067</p> <p>030 1067</p>	<p>Engine assembly stand</p>	
<p>6067/115</p>	<p>Angled clamping plate</p>	
<p>142710</p> <p>030 1127</p>	<p>Removing tools for the gasket ring of the crankshaft</p>	

	<p>Centering pin for control lever, injection pump</p>	<p>No. 100 730 030 1177</p>
	<p>Shim for dolly 143 420</p>	<p>143 430</p>
	<p>Dolly for camshaft gear</p>	<p>144 130 030 1129 New OTC</p>
	<p>Tensioning device for toothed belt, hydraulic pump</p>	<p>144 600 030 1128</p>

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